THE JOURNAL OF GAS LIGHTING
WATER SUPPLY & SANITARY IMPROVEMENT

VOL. XCIII. No. 2229.] LONDON, JANUARY 30, 1906. [58TH YEAR. PRICE 6d.

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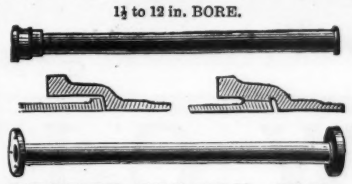

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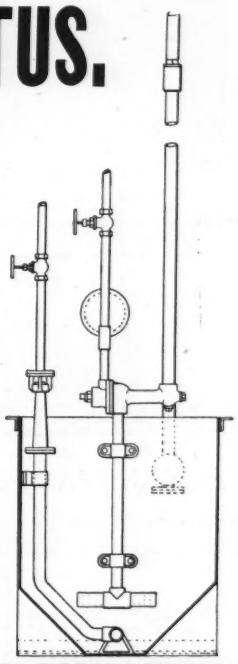

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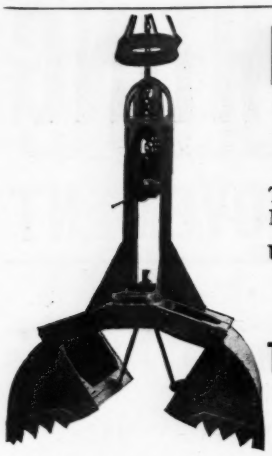

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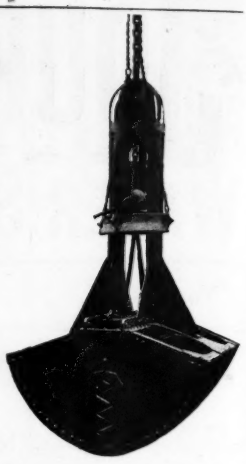

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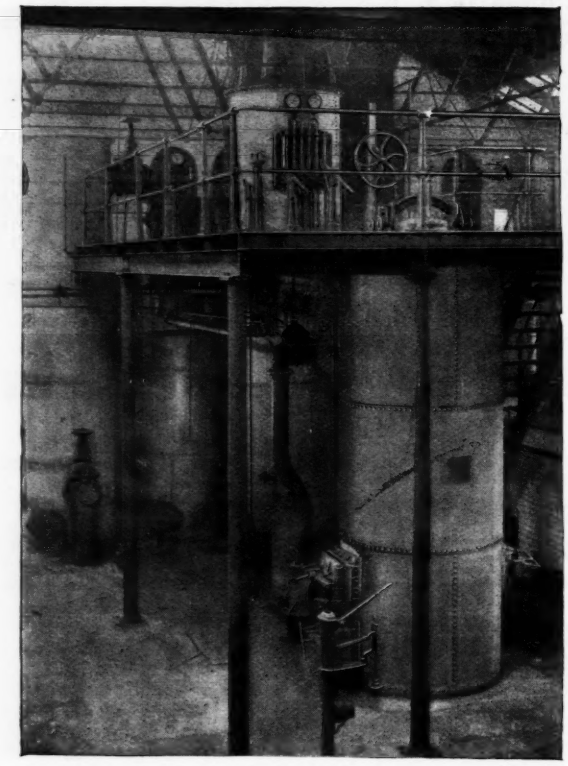

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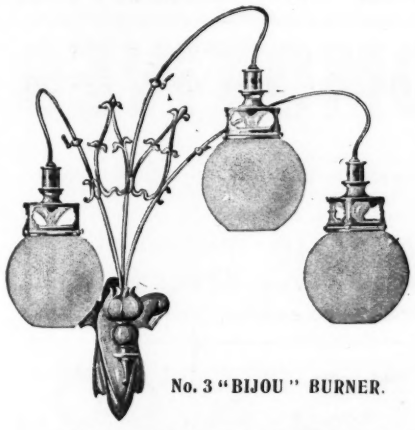

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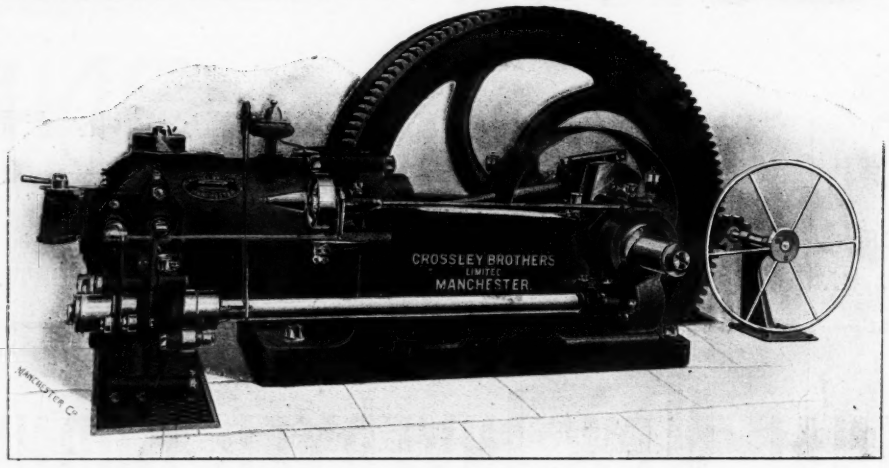

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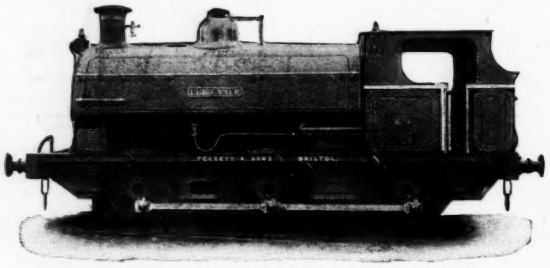

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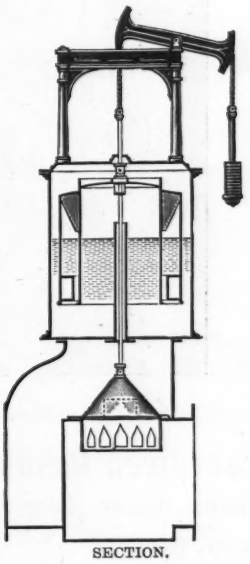

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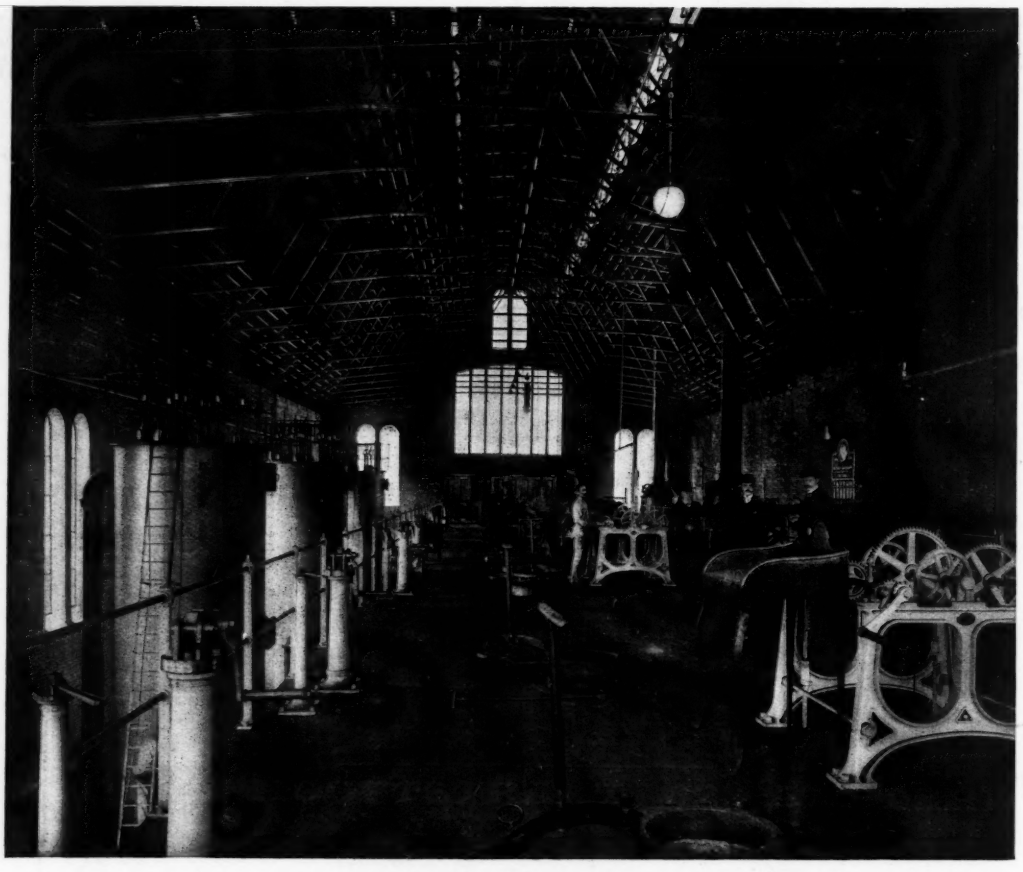

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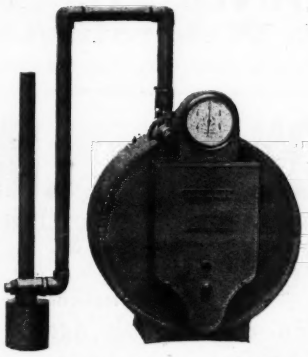

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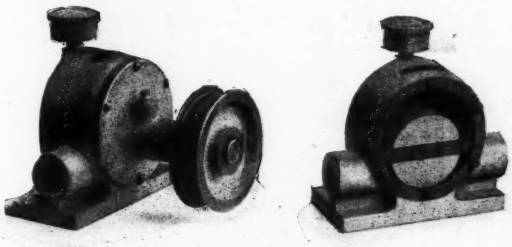

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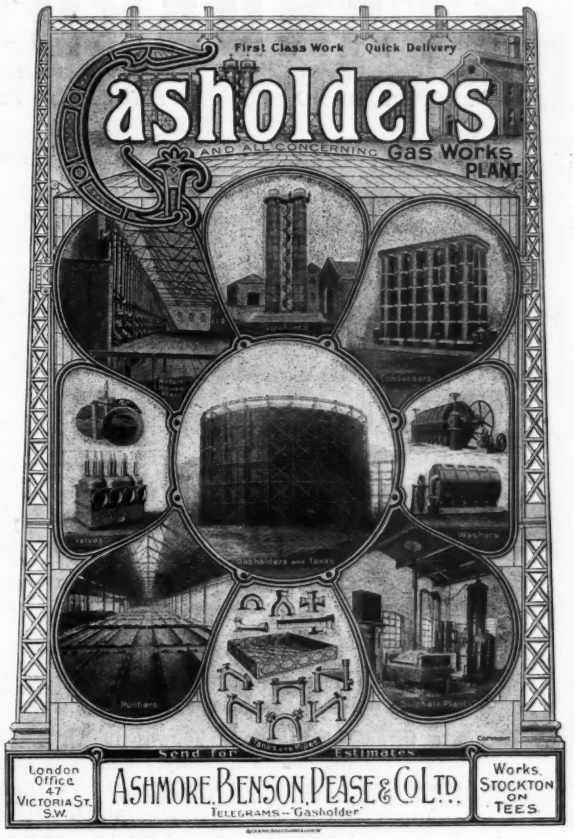
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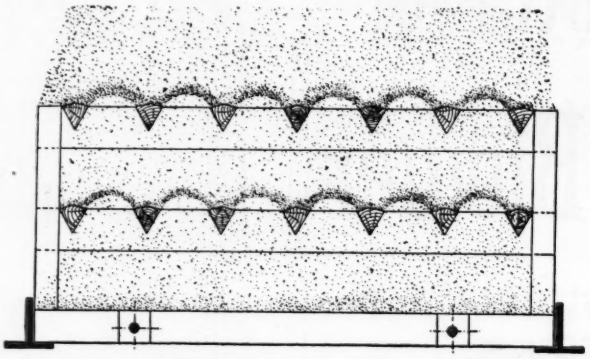

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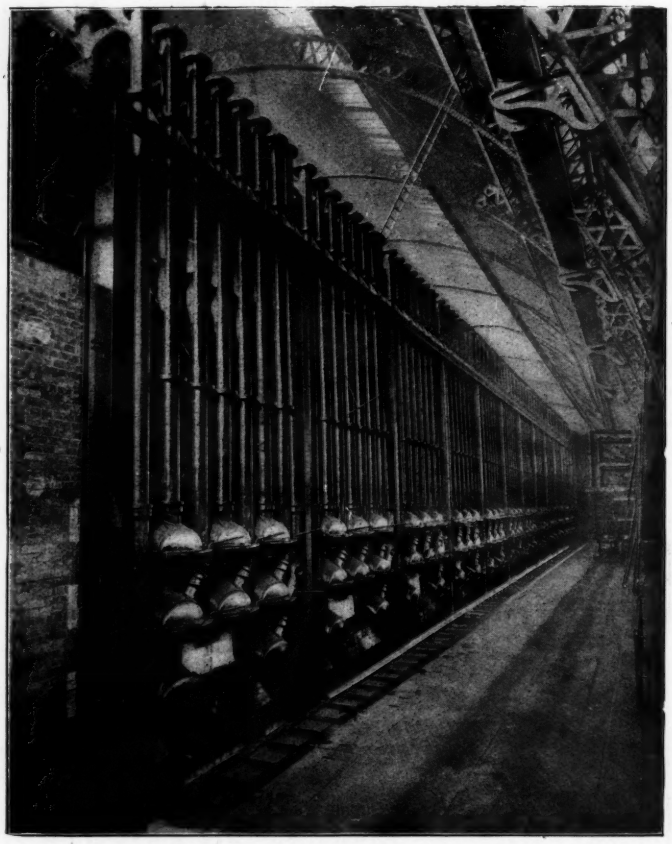

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EDITORIAL NOTES—GAS, &c.

The Gaslight and Coke Company's Report.

A NET deficiency of £36,110 in the amount required to pay the customary dividend at the rate of £4 8s. per cent. per annum, is the greeting to the shareholders in the first paragraph of the above-named Company's report just issued, which, with the statement of accounts, will be found elsewhere. Put in a somewhat different form, the net profit made during the half year is sufficient for a dividend at the rate of just under 4 per cent. per annum; but the Directors recommend one at the above-mentioned rate of £4 8s. per cent., carrying forward to the next half year a greatly reduced balance. Thus, the undivided balance has again to be drawn upon in order to maintain a rate of dividend to which the shareholders are fully entitled under the provisions of the sliding-scale, and which was determined upon in more prosperous times, with, it is to be hoped, no idea of being compelled, for its maintenance, to deplete the undivided balance during a period which has not been attended by any exceptional circumstances, either in the shape of labour troubles or abnormal prices of coal or other materials. Nor has it been coincident with any attempt on the part of the Company to bring the price of gas more into line with the prices charged by the other Metropolitan Companies. A 1d. reduction was made eighteen months ago; but the price at present charged north of the Thames —viz., 2s. 11d. per 1000 cubic feet—compares unfavourably with the latter, particularly if regard be had to the magnitude of the consumption to which it relates. Indeed, if cheap gas be a real criterion of the success of any gas undertaking, which it surely is, then, judged by this standard, the Gaslight and Coke Company at the present time falls far short of being the success its best friends could desire. Heavily weighted, too, as it is, with capital, from the burden of which the redemption fund under the Act of 1903 affords but infinitesimal relief, it seems to be almost an impossibility that the Company can ever regain the satisfactory position which it occupied not so very many years ago, or can even hope to compare favourably as to price of gas with the less advantageously circumstanced Suburban Gas Companies in the immediate vicinity. This is a melancholy admission to have to make with regard to the largest Gas Company in the world.

There are, however, some encouraging signs of improvement discernible by comparison with the working of the corresponding half of last year. First and foremost, the increase of 1·2 per cent. shown in the consumption of gas, notwithstanding the mildness of the winter and the comparative absence of fog, although smaller than the corresponding half year, cannot but be regarded as highly satisfactory; for it indicates activity on the part of the Company in their competition with electricity. In this connection may be noted an increase of £2610 for stove-rental, which is all to the good in so far as it may indicate an increase in the number of gas-stoves in use. It is noticeable, moreover, that the balance of the fittings account in connection with automatic meter supplies has now been brought down to £62,355—this item figuring a year ago as £92,865. While, also, it is true that the receipts for coke and tar products show a falling off out of all proportion to the reduction in the cost of coal and oil, on the other hand ammonia products show a satisfactory increase of over £8500. The item for repairs and maintenance has been swollen, apparently, by a charge for depreciation of works or plant abandoned; and in wages there is a reduction of £7710, which is something to be thankful for, as indicating an increased use of machinery The cost of purification is less by nearly £5000. This is certain to be affected in the future by the operation of the London Gas Act, 1905, as to which the Directors state in their report that it is "too early as yet to make any definite statement as to its effect on the Company's working." But that this will be favourable is regarded by outsiders as practically assured. No shareholder will, it is to be hoped, be disposed to grudge the increased contribution to the officers' superannuation fund, as disclosed by the accounts; while the statement that the Directors have succeeded at the quinquennial re-valuation in obtaining a considerable reduction in the rateable value of the Company's property, will be received with unqualified satisfaction. The report refers becomingly to the displacement of electricity by high-pressure gas for street lighting, in which conspicuous examples have been set by the controlling authorities of some of the most important districts supplied by the Company. These examples are to the manifest advantage of the entire gas industry, since they can be, and are, pointed at as unimpeachable evidence of the superiority of gas for such purpose. It but too often happens that a local authority owning an electric light undertaking gives undue preference to electricity, and deliberately adopts that which experience has proved to be a comparatively inefficient system of street lighting, to the great detriment of the ratepayers and the inconvenience of the public. All that is asked for gas is a fair field and no favour; and no fear is apprehended as to the result.

The capital expenditure amounted in the half year under review to £88,476, by far the principal portion of which related—as has now become usual—to distribution; only £13,559 having been expended on extension of works. The sale of surplus land and plant, together with the depreciation of the latter, reduced the total capital expenditure by £36,234, to £52,242, which is less than 0·4 per cent. of the total expenditure to date. This is satisfactory in comparison with the increase of 1·2 per cent. in the consumption; but much more remains to be done, if the present comparative disproportion of capital to business is to be appreciably reduced.

Large Reduction in the Price of Thorium and the Effect on Mantle Prices.

THOUGH no definite explanation can be given as to the cause producing their action, the announcement which we are able to make in another column, as to a substantial reduction in the price of thorium by the German Syndicate from 53s. per kilogramme, less 7 per cent. and other small considerations, to 27s., less the smaller rebates, is none the less welcome. The process of raising the price to the abnormal figure first mentioned has been a gradual one, extending back to some four years ago; the return to the figure then ruling has been so remarkably swift that those who are not in possession of the secrets of the Syndicate (who have had things so much their own way) can only surmise that there is thorium competition within sight that would sooner or later force them to recede. And we suggest that this competition may be coming from Brazil itself—seeing that Messrs. Gordon and De Freitas are not the only concessionaires of monazite deposits in that country at the present time. The parties just named are those who are working with the German Syndicate; and for all excess in price that the latter can command over 28s., the concessionaires, we believe, take two-thirds and the German Syndicate one-third. It is, therefore, hardly likely that they would, at such a distance from the expiration of their agreement, forego this excess, if it were not to make their position the more secure.

The reduction, however, sudden as it has been, has not been the work of a day; it has been as carefully and secretly planned as stratagem ever was. In the agreements with the mantle makers was a "falling-price" clause; but the Syndicate took care that all deliveries under running contracts were made before any announcement was published respecting the reduction. The result of this is that mantle makers find themselves with stocks of, and mantles made from, thorium bought at top price; while the current quotation

for the material is that of four years since. In view of this, it will be unfair to press the mantle makers too vigorously for reductions. With high-priced material in hand, they cannot really afford to at once reduce by any substantial amount; and, moreover, it should be remembered that, during the time there have been these successive increases in the price of thorium, the prices of mantles have, through competition, been steadily on the decline. What we would suggest is: This reduction in thorium is in the nature of a windfall, and it might well be employed partially in making a small reduction in price, and partially in improving the quality, of the mantles supplied. No one can tell how long it may be before the German Syndicate and other interested parties may see their way to re-establish the *status quo*. They appear to be willing to contract ahead for a twelvemonth, and no more. Mantle makers will act accordingly; for there seems no reason for believing that prices can go below 27s. per kilogramme. There has been some effort at getting the mantle makers to combine over the matter of price; but we believe that an agreement affecting the price of mantles is as far off to-day as it has ever been since there has been an open market for mantles. Neither in Germany nor in this country do we think that anything in the nature of a "ring" would be possible. The present occasion is one, however, when what is fair as between buyer and manufacturer and manufacturer and buyer ought to be fully weighed by both.

The Municipal Accounts Committee.

THE President of the Local Government Board has redeemed the promise made recently to appoint a Departmental Committee to inquire into, and report upon, the question of municipal accountancy; and the fact that it is Mr. John Burns who has been moved to make this appointment is indicative of the length to which public distrust of local financial records has penetrated. The reference is one which the members of the Committee will find beset by difficulty in plenitude; for the subject of their investigation is a perfect labyrinth, upon the construction of which the best wit of man has been concentrated. The constitution of the Committee, however, does not meet with general approval; and when the names and positions the members hold are inquired into, it is seen that officialdom is strong, and independent expert assistance has been almost entirely excluded. This is to be deplored; and the result of their work can be the only test of the disinterestedness that they bring to bear upon it. The appointment of the Committee is the outcome of a recommendation of the Joint Select Committee on Municipal Trading which sat in 1903, and which Committee's report showed how very real is the necessity for more effective protection than ratepayers at present possess. The late Government, however, evidently had their hands too full to give attention to a domestic matter in which the whole country and its industries are deeply concerned; and the municipal authorities, or their representative organizations, made no move in urging the taking of steps to clear away what they hold to be the aspersions that cluster round their financial operations. Thus it has been left to the new official head of local government to correct the neglect of a well-considered recommendation, and appoint a Committee.

It cannot, as we have said before, be denied that unchaste local account keeping has become greater the further the departure from the legitimate functions of local governing bodies; really sound financial method having been made subservient to the exigency for putting the best possible complexion on unremunerative trading departments. This is largely due to the fact that the official orders relating to local accounts are marvels of antiquity, that they make no proper provision for municipal trading concerns, that there is no systematic audit of a kind that is free from influence in one form or another, and that to a grave extent the *personnel* of our local bodies has undergone change, and the transition continues. But for the disorder, the disuniformity, and the corrupt accountancy, the officials of local authorities are not blameworthy; for they are only the unwilling instruments in these matters of those whose commands they have to obey. And no one would be greater pleased than themselves to see an honest, and as near as possible uniform, rendering of the local finance. Though the matter be of such serious importance, it is humorous to find that the first item in the reference to the Committee is to inquire into, and report upon, "*the* system" on which the accounts of the local authorities are at the present time kept. In the plurality of systems it will be found that there is not one which is so common that it can be chosen as complying with the terms of the reference. The second item in the reference is to report generally as to the system on which the accounts of the various local authorities in England and Wales should be kept, and in particular whether such accounts should be prepared on a system requiring the entries of receipts and payments to be confined as far as possible to actual receipts and payments of money or not. Here is a moot question; as some local bodies adopt what one authority on these matters has contended is the rational method of bringing into account all the income whether it is actually received or not, and all the expenditure or liabilities incurred whether actually discharged or not. The third item of reference is as to whether any regulations should be made on the subject, regard being had to the necessity for showing accurately the amounts raised by local taxation, and the purpose for which they are applied. The necessity for such accurate showing is indisputable. There has been enough concealment; and what is wanted is openness and frankness, so that all who are interested in doing so may make fair judgment of the financial positions without being frustrated at every turn as now.

The reference embodies but one of several important matters affecting the spending of money by local authorities; but it will be a great point gained to improvement in other respects if accounts of our local receipts and expenditure, and separate accounts of each trading undertaking, are in future presented in unambiguous form, with fair and full charges made in respect of every department, without one or more bearing some of the expenses of another as is so frequently the case now. It ought not to be impossible for expert accountants to prescribe standard forms of accounts for municipal and other local authorities which anyway could be closely followed, although doubt was expressed by the Committee of 1903 as to the possibility of this, in view of the varying conditions existing in different districts. To the prescription of accounts, however, a proper audit is a necessary accompaniment, and a proper audit could best be obtained in the manner advocated by the Committee of two years ago—by the appointment of professional auditors for the purpose, who are not subject in any way to local or central influence, but whose report should be forwarded by the local authority to the Local Government Board, with an independent one from the auditor himself when an authority refused to carry out his recommendations. This question of an effective audit is of considerable moment; and the appointment of the present Committee, it is to be hoped, is the first step towards its realization. An audit such as that which was outlined by the Committee on Municipal Trading would not be altogether to the taste of many of the authorities; but those who feared most would be those who were most blatant in their objections.

After all, there is excuse for a little scepticism as to whether any real good will come out of the present inquiry—more especially in the presence of the inspiriting words of the Prime Minister and the President of the Local Government Board to municipal authorities to perseverance along the roads in which financial squandering and speculation abound. The words used by the Prime Minister, in his Albert Hall speech in December, boded no good: "We can "do what in us lies to prevent the central departments from "being in any sense a drag on local enterprise, and make "these departments stimulate and inspire." There would have been greater satisfaction had the word "private" been used in the place of "local." Mr. Burns, too, has promised that his ministerial exertions shall include "the relief of "municipal activity;" and in this he will no doubt be most loyally supported by the sixty or so labour members who will be sitting in the new Parliament, seeing that one and all are pledged to work for the unfettered control for municipalization. A majority, too, of the 135 members of the new Parliament (including about thirty members of the London County Council), who are or have been members of county or local bodies, may also be counted upon to render aid in obtaining yet greater liberty of action. Seemingly, therefore, it will largely rest with the House of Lords to apply the brake when local authorities attempt to overrun reasonable limits. However, should by good fortune reformation of local accountancy result from this Departmental Committee, and ratepayers have their finances presented to them in intelligible and correct form, this will not fail to "stimu- "late and inspire" activity outside Parliament in order to

counteract the activity that is certain to proceed within in favour of granting yet greater licence in the matter of local government.

Ambition of the Liverpool Corporation—Gas Provisional Orders.

THE applications to the Board of Trade and to the Local Government Board, under the Gas and Water Works Facilities Act, 1870, are as a rule of mediocre character; and it is rarely there is anything in them that calls for more than general notice, to keep intact the parliamentary history of the concerns adopting this process for obtaining ordinary and additional powers. In greater part, the Orders for which application is being made in the forthcoming session are of commonplace kind; but there are a few matters both in these and the others which claim remark. Of first importance is the application which the Liverpool Corporation are making to the Local Government Board to invest them with all the powers necessary to the manufacture and supply of gas to Fazakerley, which is a parish as to the existence of which until recently very few readers of the "JOURNAL," we venture to think, had any notion. It is a place within the administrative limits of the Liverpool City Council; but it is not, it seems, within the area (large as it is) of the Liverpool United Gaslight Company. It is clear from this that Fazakerley has not hitherto appealed to the Company as a land of promise for enterprise; but we have not the slightest doubt that the Company would have been, and are, prepared to take the requisite steps for giving the township a supply of gas on reasonable terms. Now what good do the Corporation think they are going to accomplish by taking this step independently of the Liverpool Gas Company? Is it that they are going to benefit the people of Fazakerley in a way that the Gas Company cannot do? If it is, there can be no two tenable expert opinions as to their mistake. Is it that this is considered an excellent opportunity for having a fling at what is, in these times, falsely described in the Council as the "monopoly" of the Gas Company? If so, the fling will be an expensive one, if persevered in, for the ratepayers and those who will consume the Corporation gas in Fazakerley. Is it that there is a growing prurience in the City Council for municipalization, and that this is the "thin end of the wedge" that the "progressive" councillors have discovered? If so, then our advice to them is to look well all round before essaying to drive a wedge that will be ineffective save in the production of costly results.

The Gas Company are now supplying gas which more than complies with the statutory requirement of 20 candles consumed and tested in a flat-flame burner, which is not the best means (excluding incandescent mantles) of crediting the gas with its greatest light-giving capability. Gas of this 20-candle brand, so severely tested, is sold to the consumers at 2s. 6d. per 1000 cubic feet. Can it be that the Liverpool Corporation are so deceiving themselves that they expect, by works that would be toy ones in comparison with those owned by the Gas Company, to be able to deal as well by the people of Fazakerley as the Company with their possessed aggregation of conditions, every one of which is conducive to cheapness? The draft Order shows that the Corporation are proposing the same quality of gas, and similarly tested, as is supplied by the Company within their area; and they are asking that the maximum price shall be 4s. 6d. per 1000 cubic feet. With small works, with a small business, with but limited opportunity for expansion, with the annual interest and repayments of principal, with the provision of reserves, with the greater cost that a small business involves in proportion to a large one—with all these disadvantages against them, the Corporation are (palpably to gratify nothing but a passing whim or the ambition of the devotees of municipalism) proposing to make the people of Fazakerley pay a higher price for gas than there is any need for. In short, they contemplate such service as can be rendered by an infant undertaking, while not far off is another concern which could, through its accrued great strength, render more efficient and economical service, if the time has already arrived for supplying gas to the parish. It appears to be another illustration of the subordination of economy to the indulgence of the animosity to successful private enterprise, born of the desire to possess, that—more the pity!—exists with deep root in municipal circles.

But enough of the highly-questionable step that the Liverpool Corporation are taking. Almost featureless are the applications of the Companies to the Board of Trade. They follow much on the lines of the Bills which have been noticed lately. The small Companies, like the larger ones, are fully alive to the position of the illuminating power question; and it is agreeable to find among them three Companies—the Newport Pagnell, Portardulais, and St. Austell—who are asking for authority to supply 13-candle gas. These three Companies bring the total up to eight, who will—if conciliation of local authorities before the Bills come before Parliament, or the Board, does not effect a change—be opening the road to lower illuminating powers by giving 1 candle below (to 13 candles) what has been the customary standard allowed in recent sessions. In this batch of applications, there are further instances of confusion on the point of the standard testing-burner. The Newport Pagnell Gas Company have declared in favour of the "Metropolitan" argand burner No. 2. The provisions as framed in other cases specify former burners and methods, but arrange for the adoption of such other burner as may be approved by the Board of Trade. The Chichester Gas Company are asking the Board to remove the liability to forfeiture in respect of sulphur impurities other than sulphuretted hydrogen; and, as was reported last week, they have successfully averted any opposition on the part of the Corporation. It is rather curious that, among the applications for these Provisional Orders, there should be three Companies who, in respect of borrowing powers, are only desiring to be allowed to raise in this way one-fourth of the issued and paid-up capital; while one-third is now the recognized proportion. There are no other points that present variation from the ordinary provisions in modern gas legislation.

In bringing to a close these notices of the Gas Bills and Orders that will engage the attention in the coming session of Parliament, the increasing heaviness of the task imposed in picking from the mass of printed matter of which the measures are composed, the features of current interest once more enforces the need for a General Gas Act to further amend the Gas-Works Clauses Acts, and to incorporate all modern ordinance affecting gas supply that, for the want of such a General Act, unnecessarily loads and makes more costly present applications to Parliament. Mr. J. Shiress Will, K.C., in his introduction to "Michael and "Will," points to the fact that the General Acts no longer embrace all the "provisions usually contained in Acts of "Parliament authorizing the construction of gas-works;" and then he refers to several clauses that are now usually inserted in Acts of Parliament. The matter arose again during the discussion on the recommendations of the Board of Trade Departmental Committee, and has several times been referred to in the "JOURNAL"—notably July 19, 1904. The time has long been ripe for the revision and amplification of the General Acts; and the sooner the matter is taken in hand, the better will it be for the gas industry.

The Ilford Gas Company's Litigation.

As will be seen from the reports in our "Legal Intelligence" to-day, of the Official Referee's judgments in two cases against the Ilford Gas Company, which were delivered on Saturday last, the Company's litigation may now, we should hope, be considered practically at an end. The stringent remarks which Mr. Muir Mackenzie put into his judgments should give pause to any further litigants who are anxious to present inflated claims for payment by the Ilford Gas Company in particular, or Gas Companies in general. The cause of all this legal fighting was a flood in the Roding Valley in June, 1903, which damaged—very slightly, it may now be said—certain property, and for which very small damage the Ilford Gas Company, after many trials, have been held liable. The litigation began on April 14, 1904, by Mr. Benning, as plaintiff, and has been going on ever since; the part of plaintiff being played by a variety of people. Several Judges have heard the various actions—Mr. Justice Grantham, Mr. Justice Darling, Mr. Justice Lawrance, besides the Lord Chief Justice, and, in the Court of Appeal, the Master of the Rolls and Lord Justice Cozens-Hardy. But at length the judgments of the Official Referee, to whom two cases were referred for assessment of damages, bring the matter to a close.

In the first case, the East Ham Corporation were the plaintiffs, and began with a claim of more than £1000, which dropped first to £913, then to £747, and the award amounts

to £120. The Corporation practically sought to make the Ilford Gas Company pay for all repairs to the roads in the flood area, even where those repairs had been done only last year, and in some cases even after the action had been brought. We call attention to the learned Referee's severe comments on such proceedings. "I cannot approve of such "a manner of shaping a claim," he said. "A great part of "the claim made was unreasonable." We hope that other Corporations will learn from this case that, in framing their claims against Gas Companies or other defendants, it is always well (not to put it any higher) to figure them at a fair, just, and reasonable amount.

The Ocean Accident and Guarantee Corporation's claim was, as regards amount, an even more remarkable one; for they claimed something approaching £13,000, and they are awarded £156 15s. Instead of getting about £60 for the alleged damage to each of their 209 houses, they obtain exactly 15s. per house. We are therefore right in saying that these judgments are verdicts for the Ilford Gas Company; and we heartily congratulate them—their Board, Engineer, and Secretary—on the result. They have had long to wait, and a wearying fight to obtain this fair victory; but it must be doubly gratifying now—especially in view of the terms of the judgments, the orders as to costs, and the undoubtedly beneficial effect the result must have on all intended and inflated claims. The lesson taught by these judgments was one sadly needed; and we hope that, as a reward to the Ilford Gas Company for their part in it, they will have ever-increasing success in their undertaking.

THE GASLIGHT AND COKE COMPANY.

The Half-Yearly Report.

The following is the report on the working of this Company during the six months ending Dec. 31, which, with the accounts [see p. 302], will be submitted to the proprietors on Friday.

The accounts for the past half year show that, after providing for the fixed charges, and setting aside £10,000 for the half year towards the redemption fund, in accordance with the provisions of the Company's Act of 1903, there remains a balance of £298,801. The amount brought forward from the previous half year being £217,408, there is a balance available for distribution of £516,209, out of which the Directors recommend a dividend on the ordinary stock at the rate of £4 8s. per cent. per annum, which will absorb £334,911; leaving the sum of £181,298 to be carried forward to the credit of the current half year.

The sales of gas for the half year show an increase of 1·2 per cent. over those of the corresponding half year of 1904. There has been an addition during the past half year of 17,662 consumers in the Company's district. Coke and tar products failed to realize such good prices as in 1904; but the reduction in income from these sources has been partially met by a larger revenue from ammoniacal liquor products and a saving under the item of coal.

The London Gas Act came into operation on the 1st of January; but it is too early as yet to make any definite statement as to its effect on the Company's working.

There are several Bills before Parliament which may, directly or indirectly, affect the Company's interests; and the Directors will take steps to protect those interests.

The experimental lighting of some of the most important streets in the City of London by means of high-pressure gas in lieu of electricity has now been inaugurated, with, it is believed, complete success.

During the past half year the quinquennial re-valuation of the Company's property within the Metropolis has taken place; and the Directors have pleasure in reporting that the Company has succeeded in obtaining a considerable reduction in the rateable value of its property.

With much regret, the Directors have to announce the death of Mr. Allen Stoneham, one of the Auditors of the Company. Mr. J. J. Walker, the other Auditor, retires, but is eligible, and offers himself for re-election. For the vacancy caused by the death of Mr. Allen Stoneham, two candidates—Mr. P. H. Ashworth and Mr. J. A. Stoneham—both duly qualified stockholders, offer themselves for election at the general meeting.

In the course of a notice of the new notification of the Metropolitan Gas Referees, which appeared in a recent number of "Nature," the writer, when referring to the prescription of a method of determining the calorific power of gas says: "The calorimeter which has been devised by Mr. C. V. Boys appears to be a distinct advance over its predecessors of the same type; and when it is installed in the testing-stations, systematic measurements of the calorific power of London gas will, for the first time, be on record, and will be available for the next battle on the gas question—Calorific Power *v.* Illuminating Power."

THE GAS STOCK AND SHARE MARKET.

(For Stock and Share List, see p. 309.)

THE past week on the Stock Exchange was no better than the one before. It opened dull, owing, in great measure, to the influence of the monetary situation; and some markets could not shake off their nervousness in regard to future special legislation at the hands of the new rulers of the country. With some little fluctuations from time to time, this tone prevailed up to the close. Fresh business was quiet; the settlement for the end of the month being a serious item. The stringency we noted last week in the Money Market continued; and the strong demand was augmented by the Stock Exchange requirements in the face of an inadequate supply. Business in the Gas Market was lighter in volume, owing to there being fewer dealings in the two bigger issues which generally furnish a large proportion of the marked transactions. But the prevailing favourable tendency was not impaired; and though few changes in quotation were made, they were almost wholly in the upward direction. The only exception in the London market was Gaslight and Coke ordinary, which receded another half-point. Of the actual prices marked, the top figure, 102¾, was done on Monday, and the lowest, 101½, on Friday. But the final figures and the opening figures were identical—102¼. The secured issues were inactive. The maximum marked 90¼ and 90½, with a small amount done free at 89½; the preference changed hands at 110⅝ and 112; and the debenture at from 87¾ to 89. South Metropolitan opened rather cheap at 130, but soon worked up to 132. The debenture was done at 87 and 87¾. Commercials continued very quiet; business being done only in the 4 per cent. stock, which changed hands at from 118 to 118½. There were a few operations in the Suburban and Provincial group. Alliance old marked 21⅜, Brentford old 264 and 265, and British 42½ and 43¼. Brighton original rose a point, but was not dealt in, and Tottenham "B" was done at 101½. On the local Exchange, Liverpool "B," which had been put much in advance of the "A," was set back two points. The Continental Companies were in good odour. Imperial was more active than of late, and changed hands at prices which advanced from 232½ on Monday to 236½ on Saturday; and the quotation was put up 3. Union was first done at 130 and rose to 132, with an advance of 1 in the quotation. European, after marking 22⅞ for the fully-paid, was made *ex div.* at the old prices unchanged. Among the undertakings of the remoter world, Buenos Ayres was done at 12⅝, Primitiva ordinary at from 7 3/16 to 7 5/16, ditto preference at from 5½ to 5⅝ *cum div.*, and from 5 1/16 to 5½ *ex div.*, and ditto debenture at 98¾ and 99. River Plate changed hands at from 12 15/16 to 13⅛, ditto debenture at 96¾ and 98, Monte Video at 11¾ and 12, and San Paulo at 13¼ and 13⅜. Cape Town ordinary was done at from 17⅛ to 17⅜, ditto preference at 10¼, and Melbourne 4½ per cent. at 104½.

The closing prices are shown in our Stock and Share List on page 309.

ELECTRIC LIGHTING MEMORANDA.

The New Parliament and Electricity Supply—Proposed Electric Lighting Experiment in the City—Troubles with Street Arc Lamps—The Hire-Purchase of Electric Motors.

THE advocates of municipal trading in electricity are finding considerable consolation in the fact that there is a new Government, and that now municipal enterprise (which is the municipal euphemism for speculation) will receive a fair hearing. We have been for years now labouring under the impression that municipal electricity supply has had an exceptionally good hearing, and that local authorities have had little occasion to grumble over the extraordinary complaisance extended to electricity undertakings of all kinds by both the late Government and the Board of Trade. What more can be wanted, we cannot understand. However, the pleasure that is being manifested over the change of Government is visible on all hands; and perhaps more than ever we shall have reason for gratitude that the House of Lords has not yet been extirpated from our Constitution, as the President of the Local Government Board desires that it should be. We may earnestly hope that the Upper House will in future use well their power to protect the ratepayers; and they may be called upon to do so very soon in connection with the electric power schemes for London. It will of course, be remembered that last year the proceedings on the London Electricity Bills originated in the House of Lords; and that Lord Camperdown's Committee sifted them down, and allocated areas to those promoters whose Bills they permitted to pursue their way. In the coming session, however, things will be reversed, and the Power Bills will commence their career in the Commons. There has been some talk of a Royal Commission to consider the general question of the electricity supply for London. May it not be that, with Mr. Burns at the Local Government Board, with thirty members of the London County Council in the Commons, and with Labour members and many others pledged to assist municipal trading, the only Power Bill for London that will be sent up to the Lords will be that of the London County Council? If it is, the

Lords, without doubt, will be made fully acquainted with the report of the Finance Committee of the Council and with the refusal of the support of at least half of the Borough Councils to the County Council's scheme; and after looking into the vague plans of the Council, they will assuredly see that their duty to the ratepayers allows of only one course of action—that is to say, the complete rejection of the hazy scheme, with its ponderous financial commitment.

The City of London Electric Lighting Company, who have in the past made such an excellent revenue out of the ratepayers of the City at £26 per indifferent arc lamp, have proposed a demonstration of the capabilities of modern arc lighting. They have already spotted the City with one or two, which have not been satisfactory; but this is a fresh scheme. The daily papers last week advertised the fact, though it appears the proposal was made last November, and has, so it is said, been repeatedly shelved since. As only a few weeks have passed since we were living in November, the "repeated" shelving must have kept someone very busy in an unprofitable exercise. But that by the way. The lethargic attitude of the Company towards the public lighting was of such long duration that it required something of a startling nature to bring about reanimation in this direction; and the Company got what they badly wanted when the Streets Committee determined, and the Corporation confirmed the decision, to supplant a number of arc lamps by both high-pressure and ordinary pressure incandescent gas-lamps. The proposal of the Electric Light Company now is that they may be allowed to start, at their own cost, a demonstration to show the "superiority" of the most modern system of street lighting by electricity. The experiment it is suggested, shall be carried out in Newgate Street, Holborn, New Bridge Street, and Farringdon Street. The streets named disclose ingenuity in plotting the scheme. Its acceptance would remove the latest of arc lamps from immediate comparison with the high-pressure gas lighting now in Queen Victoria Street and other thoroughfares, and would cause the "modern" arcs to cross directly at the end of Fleet Street, which is lighted by only ordinary "C" incandescent gas-burners. To bring the latest forms of electric arc lamps into comparison with common forms of incandescent gas-burners, and not high-power or high-pressure ones, would furnish just as ridiculous a comparison, as putting high-pressure gas-lamps into juxtaposition with electric glow lamps for a relative illuminating power test. The fact that the Company offer to carry out the demonstration at their own expense is also of interest. But, if the proposal comes to anything, it will be necessary to ascertain whether this is a fair sample of the lighting the Company are prepared to give throughout the electrically lighted City streets at a specified figure. In view of the handsome revenue the Company have been deriving from the ratepayers, at £26 per lamp, we shall be interested in this question of cost, among the many other points that will, if a demonstration is allowed, come under observation.

The system the Company propose is to be a "modern one"—presumably flame arc lamps, whose frightful flickering and concentrated power are the greatest of the many annoyances which the sorely tried eyes of pedestrians and drivers have to put up with through the artificial light alternations in our streets. Readers know what has been done by the City of London Company in trying to impress the City Fathers by condensing a vast amount of illumination by means of these flame arcs in the open spaces at either end of Queen Victoria Street. But the corporators have not been deceived into believing that these are fair examples of street lighting. Specimen flame arcs have also recently been under observation at Beckenham; and they have been (especially one where traffic is most dangerous, by the railway station bridge) most unruly in their behaviour. In fairly decent weather, when the lamps are not affected by a fit of the jumps, they give a large amount of illumination round about, but there is darkness beyond; and the colour of the light, taking a perspective view, makes the ordinary arc lamps look shockingly wan. In fogs the flame arcs render no better service than the old type; and they, as do arc lamps generally in street lighting, also suffer from the fact that, if anything goes wrong, whole streets are thrown into darkness, whereas with a gas-lamp, the accidental destruction of a mantle only places for a brief time a single lamp *hors de combat*. Electric arc lamps are also subject to mechanical disorder. There are references to this in a report, on complaints of the inefficiency of the street lamps, by the Electrical Engineer of Great Grimsby (Mr. Vignoles). The report is most instructive. He considers the streets of Great Grimsby are well lighted, *when* the arc lamps are working properly. The qualification is a useful one. He also tells us that the complaints that the lamps do not always work satisfactorily are occasioned by mechanical defects, faulty trimming, or want of attention. Of course, it is impossible to ensure that lamps fitted with mechanism will always act perfectly; and, as incandescent gas-lamps are not dependent on mechanical aid, this is a favourable point for them in making comparison. Another cause of trouble is, Mr. Vignoles says, the carbons coming too close together, or to impurities in the carbons. Whatever type of lamp is used, these difficulties are bound to occur more or less. Some figures are included in the report for the purpose of showing the small extent to which the lamps were extinguished during the year ending March last and the following nine months; but the "outs" only constitute part of the ground for complaint. A system of street lighting with so many inherent defects is not one in which those responsible for the lighting of our streets, and for the public safety, ought to place great confidence.

The Liverpool Corporation are proposing to take up the hire-purchase of motors, with a view of developing the demand for electricity; and this has called forth protest from a firm of electrical contractors. On the one hand, they maintain that there is no demand in the city for electrical motors; and, on the other, that, if the demand arises, the contractors will be prepared to meet it. It is contended that the firm in question are taking up an illogical attitude; but, on examining their argument, it is not so illogical as it appears on first blush. Hire-purchase will not make a success of the business, while the costs of installation (not the initial cost of the motors themselves) and power to the users are quite as high as at present—probably because the Corporation Electricity Department prefer not to do business for power at a loss. Better lose the day load than supply at below actual cost. The charge for power and heating purposes is at present 2d. per unit up to 3000 units per quarter, and 1d. per unit beyond. An industrial firm who is so poor that they must perforce obtain a motor on the hire-purchase system cannot afford power obtained from electricity at this price. Under the circumstances, it is just what one might expect to hear that in some cases electric motors are being displaced by gas-engines. When it is seen what it has cost to instal the electric motors that are discarded in favour of gas, it is testimony to the fact that it is the cost of running that causes their supersession; so that hire-purchase is not the remedy for the slow building up of a day load. According to the protesting letter, a contractor's estimate for a motor, in a cited illustration, was £33 5s. On top of this were the charges of the Corporation for the meter and the service line, amounting to £11, and the deposit demanded was £10; so that the total cost of this small power installation was £54 5s. A further illustration is the cost of lighting a small office. The contractor's estimate for the fitting work in the office was £4 2s.; while the Corporation charge for service line and meter was £5, and the deposit demanded £3; making in all £12 2s. It is held that the Corporation charges are excessive, and the price of current too high; and that these are the obstacles to developing the day load, and not the question of the first cost of the motors. The firm's protest has drawn a correspondent hailing from Manchester, who holds up to admiration the "success" that has followed the motor hire-purchase system in that city. But numbers placed is not a criterion of real success. If all the "vexatious" charges for connections, meter-rents, and the like are abolished, and energy is supplied at an absurdly low figure, then for the day load too big a price may be paid; and that is distinctly a ratepayers' question. Electric motors do not appear to be a particularly good investment for municipal electricity departments; and power users should ask themselves why the Local Government Board have seen fit to considerably reduce the term for the repayment of loans for electric motors, and why the Corporation of Brighton, in their last financial year, had to spend £250 on the maintenance of motors which only brought them an income of £573. There is a lesson here for those who are considering the question of hire-purchase, and one for the ratepayers, who should exercise their right to prevent trading that, according to the Brighton figures, is so unprofitable.

Messrs. C. & W. Walker and their Donnington Foundry.

A rumour has recently been in circulation that Messrs. C. & W. Walker, Limited, of Donnington, Shropshire, were closing-down their foundry, and intended to give up making castings entirely. This, we are pleased to learn, is quite unfounded. Their business in the manufacture of purifying plant and other cast-iron work had grown to such an extent during late years that it had become necessary to entirely reconstruct and enlarge the foundry—bringing it up to such an improved state as their growing business and modern practice demand. For the purpose of making these improvements and extensions, the foundry has, we are informed, been temporarily closed; and arrangements were made with two or three large local foundries to produce all the castings required to Messrs. Walker's own patterns. There is, therefore, no interruption whatever in this part of their business. The reconstruction is being pushed forward with all speed; and it is anticipated that the foundry will soon be in full swing again, fitted with the most modern and up-to-date appliances.

Mr. William Curling, the late Chairman of the Thanet Gas Company, who died on Dec. 29, left estate of the gross value of £44,130.

The next meeting of the Yorkshire Junior Gas Association will be held on Saturday, Feb. 10, when the members will visit the Lofthouse Colliery, near Wakefield.

The Twenty-Second Anniversary Dinner of the Junior Institution of Engineers will take place on Saturday, Feb. 10, at the Hotel Cecil—the President, Mr. Dugald Clerk, M.Inst.C.E., F.C.S., in the chair.

The First Ordinary Meeting of the Society of Engineers for the year 1906 will be held on Monday next, at the Royal United Service Institution, Whitehall. The President for last year, Mr. Nicholas J. West, will present the premiums awarded for papers read during the year. Subsequently the President for this year, Mr. Maurice Wilson, will deliver his inaugural address.

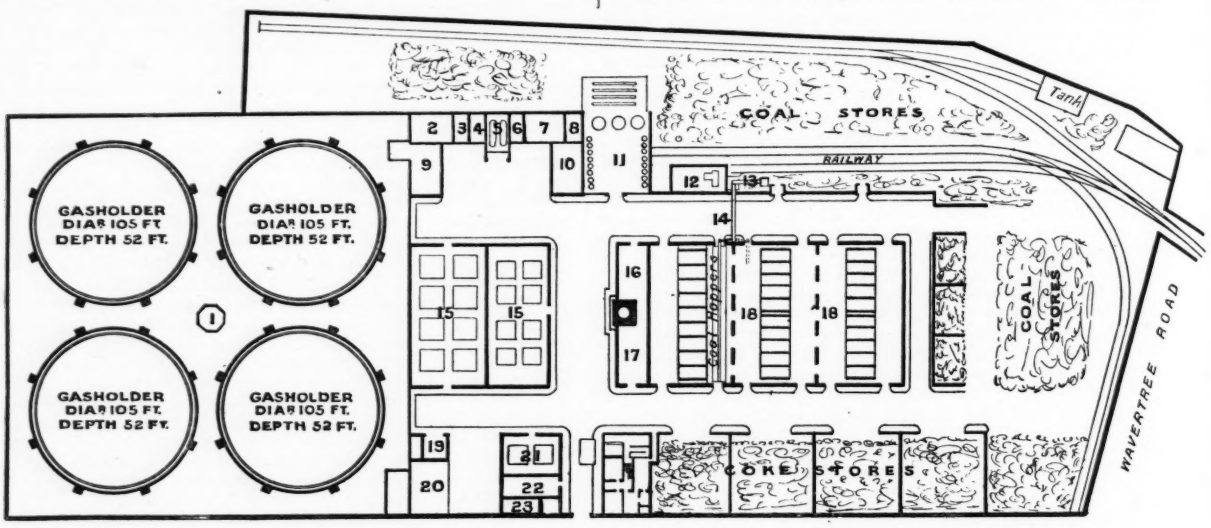
THE DISCHARGING AND CHARGING OF GAS RETORTS AT ONE STROKE.

The Fiddes-Aldridge Machine at Liverpool.

STANDING in one of the retort-houses at the Wavertree works of the Liverpool United Gaslight Company, and watching the operation of the new machine displacing shovel and rake work—which machine we have been, through the courtesy of the Chief Engineer (Mr. Edward Allen), privileged to inspect—the ever-growing truth of the maxim that has come down to us from the long-dead past, *omnia mutantur, nos et mutamur in illis*, springs to mind. There we were standing on ground for and upon which works were designed and erected by the late Mr. Alfred King (father of Mr. Allan's predecessor), an engineer honoured and of high reputation wherever the manufacture and distribution of coal gas in his day had been established. Turning to "Clegg's Treatise," we find there that the distinction of a plate was accorded to a ground plan of these Wavertree works, and that the (in the annals of the gas industry) celebrated editors of the treatise described them as a "model of compact and convenient adaptation." And indeed they were—for gas-producing works designed and built before mechanical operation in retort-houses had driven its way into the path of progress. "Model" works! They were so designed, and the plant so circumstanced, that the coal passed in at the one end and the purified gas flowed out at the other for distribution. The year in which they were opened was 1856; and—we here risk the offence of infringing the prohibition of personal remark—they were the first gas-works that Mr. Allen ever entered, and there he had his introduction to the everyday duties of the workers of our great industry.

SOME GENERAL NOTES—ILLUMINATING POWER AND PRICE.

Suspending, for a brief space, the story we have to tell of the Wavertree works. No writer connected with the gas industry can (although his immediate subject may be but a single one) be brought into contact with such an enormous undertaking as that of the Liverpool United Gaslight Company, supplying a district covering approximately 38 square miles, without picking up a few general notes the publication of which will contribute to the interest of the matter in hand. The Company have in all six stations; and at all, excepting Garston, coal gas is made. The Garston works were erected solely for the purpose of manufacturing carburetted water gas; and the plant (Messrs. Humphreys and Glasgow's type) has been in operation since 1895. To that works is sent coal gas; and the mixture of carburetted water gas is supplied to not only the Garston district, but is sent to reinforce the supply in the centre of the city. At the Linacre works there is an auxiliary plant, which was erected in 1897, when it had been found by Mr. William King how useful was the Garston plant. "It was," says Mr. Allen in conversation, "the best thing that was ever introduced into the Liverpool gas-works." The price at which 20-candle gas is now being supplied is 2s. 6d. per 1000 cubic feet; and this low price for such a high quality of gas is



1. Valve-House.
2. Mill-House.
3. Well.
4. Engine.
5. Boilers.
6. Engine.
7. Exhausters.
8. Pumps.
9. Standard Washer.
10. Smithy.
11. Condensers and Scrubbers.
12. Power House.
13. Elevator.
14. Conveyor.
15. Purifying House.
16. Fireman's Room.
17. Stores.
18. Retort-House.
19. Tar Yard.
20. Tar and Ammonia Cisterns.
21. Meter-House.
22. Governors.
23. Paint Shop.

THE WAVERTREE WORKS OF THE LIVERPOOL UNITED GASLIGHT COMPANY.

largely attributed to the use of carburetted water gas. In this connection, the exceptional quality of the gas supplied for an English city or town must be remembered; and it should also be known that the 20 candles mean 20 candles tested not with an argand burner, but by a flat-flame one. In this respect—supplying such a quality of gas, and tested by a flat-flame burner—Liverpool occupies almost a unique position among gas undertakings. Moreover, under that drastic treatment in the matter of testing, the quality of the gas is fully maintained; and this is said not on the word of Mr. Allen or any of his staff, but on the evidence of the officials of the Corporation, who are constantly testing, without the Company's knowledge, in various parts of the extensive district. The lowness of price for gas of such merit has been attributed largely to the influence of the carburetted water gas. Liverpool has, of course, excellencies in geographical situation which must also contribute; but the fact remains that in 1905 (the first complete year's working after Mr. Allen succeeded Mr. William King) carburetted water gas was being made for 5d. per 1000 cubic feet less than coal gas of like quality. Combined with the progressive improvement in working which has been going on everywhere where the management advances with the times, this cheap production of 20-candle power carburetted water gas, as Mr, Allen says, enables the Company to supply at 2s. 6d., which is, we believe, the bottom price in the history of the Company. Last year the total consumption of gas in the Company's area was roundly 4000 million cubic feet.

CARBONIZING ECONOMIES—MACHINES AND INCLINED RETORTS.

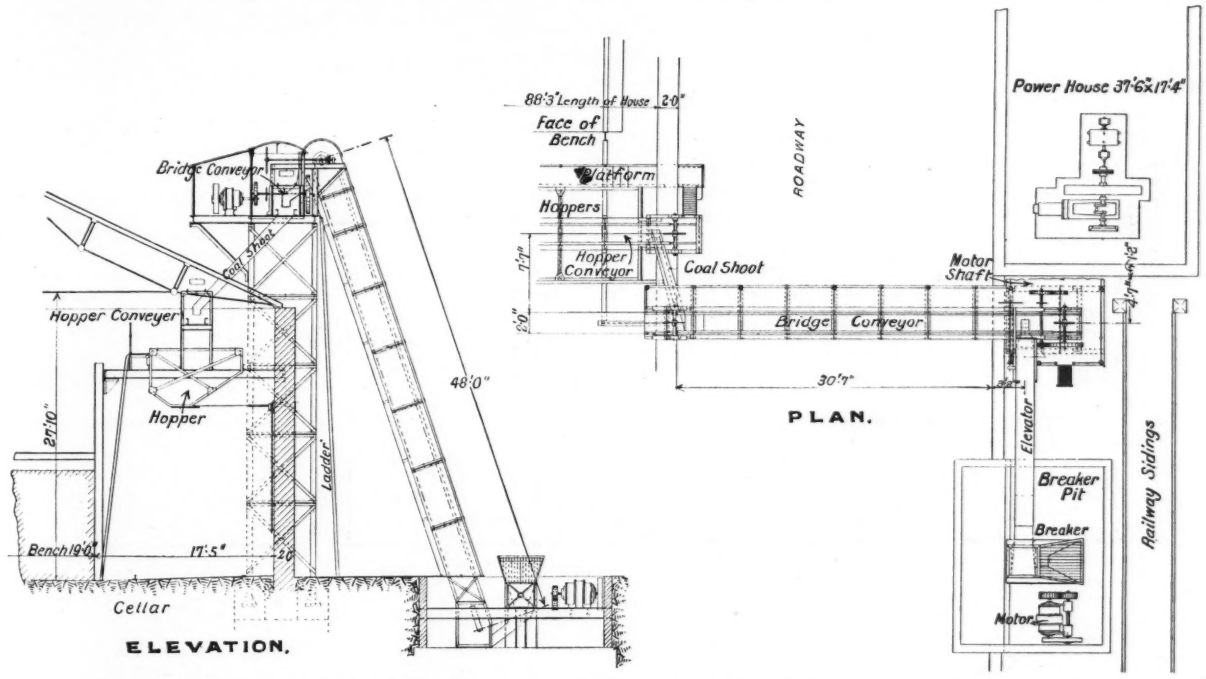
Therefore, omitting Garston, the Company have five works at which coal gas is made; and this brings us on to the line of the subject which is to be considered. Going back into the history of the application of mechanical and other inventions to the work of the retort-houses at Liverpool, it is found that the first introduction of stoking machines was at the Linacre works, which —not entirely, but very largely—are furnished with Arrol-Foulis machines. They were introduced to effect a saving; and they accomplished their purpose. Subsequently, Mr. William King entered thoroughly into the question of the inclined retort system; and very early it was his desire to have one under his own control, when he could find a type of this form of setting that worked to his satisfaction. Of Mr. King's *penchant* for perfection, we need not speak to the readers of the gas profession, He saw a great number of settings that, in his opinion, did not work satisfactorily; and the first that met with his approval were the Salford settings on Mr. S. Y. Shoubridge's system. The issue was a bench erected on a similar plan at the Athol Street works. The results of the working were so gratifying that Mr. King went forward; and at the present time, the whole of the gas sent from the Athol Street works is produced in inclined retorts. The installations comprise 192 retorts, 24 in. tapering to 21 in. by 16 in., and 20 feet on the slope. These are working to-day with perfect satisfaction; and the results obtained, Mr. Allen tells us, are of greater excellence than are obtained by the machine work at Linacre.

Considering this circumstance, explanation is needed as to the reason the inclined system does not, as opportunity arises, supplant the other methods of working. It is simply this: There are many of the Company's retort-houses in which, as is the case in all gas-works of some years' standing, inclined benches could not be introduced without altogether altering the buildings,

including the raising of the roofs. In consequence of this, Mr. Allen has been investigating the modern forms of machinery, to find one that would be suitable for the small retort-houses. In the course of his travels, he saw the Paris machine, which he characterizes as good in some respects, and not so in others. He also visited Derby, and saw the De Brouwer machines at work there. He was quite satisfied with their operation; and, in all likelihood, an installation of that type of projector and pusher would to-day have been found at Wavertree; but the price quoted at the time (probably influenced by circumstances then ruling) was rather higher than the Engineer considered he was justified in recommending to his Directors. The matter of adopting a new type of machine was, owing to this, left in abeyance for a short time. Then the article on the Fiddes-Aldridge machine at Pontypridd was published in the "JOURNAL" for Oct. 25, 1904; and, at once, the fundamental idea from which the machine sprang, of achieving the discharging and charging of a retort in one operation—that is to say, at one stroke—made a favourable impression; and, on further explanation by one of the inventors, Mr. Allen says that he was charmed with the simplicity of the lines of the design which accomplished the purpose. Following this, a visit to Pontypridd, where, it will be recollected, the machine was working on a small scale—not regularly, but working—eventuated in an installation at Wavertree.

THE WAVERTREE WORKS.

In the desire to incorporate in this article at convenient places incidental matters of interest, another little break in the story of introduction and experience may be made here. We have spoken of the Wavertree works having been originally designed by Mr. Alfred King; but, of course, the necessities of modern times have led to some modification and additions of new plant, in order to keep the works up to date in economical and efficient working. This, it is evident, has always been an object of the Engineers. For instance, the exhausters are quite modern; and are of the Donkin pattern. They have replaced Mr. Alfred King's ingenious gasholder pump exhausters, which were of a very nice type, but one that could not be over-driven. For old association's sake only, an example is being kept in use at the Eccles Street works. Then it is also seen that four purifiers, on Green's system, have been installed, with "Standard" grids, and Milbourne's patent fastenings. The boxes are 43 ft. by 22 ft., each being fitted with four lids, 18 ft. by 7 ft. The boxes are elevated, and the purifying material is dealt with by a continuous bucket conveyor (put in by Drakes Limited), running underneath the boxes up one end wall, along the roof principals, and down the opposite end wall. This conveyor is worked by a 4-horse power electric motor, supplied with current from the plant installed in connection with the Fiddes-Aldridge retort discharger-charger. The purifier-house, it may be mentioned, is lighted by Keith-Blackman lamps outside the windows; the burners being supplied with gas at 7 inches pressure direct from the gasholders. These lamps throw quite a flood of light into the purifier-house at night time. It was also noticed that there are four holders on the works, two of which have recently had a third lift added. With the expansion of the operations of the works, too, a little more land has been taken in,



THE COAL HANDLING PLANT AT THE WAVERTREE STATION OF THE LIVERPOOL UNITED GASLIGHT COMPANY.

which (though, as seen by the plan, it has somewhat destroyed the symmetry of the contour) has been found most useful. It has given more coal storage ground, and space for additional pipe condensers, a "Standard" washer-scrubber, &c.

THE MACHINE-WORKED RETORT-HOUSE AND ITS COAL PLANT.

The carbonizing plant at this station is distributed in a block of buildings divided into three houses. In two of the houses (where handwork is still the vogue), there are ten beds of six ⏀ retorts, in benches 18 feet wide. In the middle house, while the retorts are 20 in. by 14 in., the mouthpieces are reduced to 18 inches, so that the retorts will have to be reset before machine work can be adopted. It is in the south house that the Fiddes-Aldridge discharger-charger has been installed; and in that the retort-bench was reset rather more than twelve months ago, so that it is now in its second season's work. The bench consists of nine beds of six ⏀ retorts, 22 in. by 16 in. by 19 ft., set in three horizontal rows. They were the work of Messrs. Gibbons Bros., and are of the firm's regenerative type, with deep producers.

To this house coal-handling plant has been applied; and this plant was all ordered and designed preparatory to any determination as to the form of stoking-machine that should be adopted. From this it will be gathered that it was designed in manner suitable for any type of machine. It is perhaps convenient to say here that the Fiddes-Aldridge machine has been installed on approval; and we think our prediction that the machine is there to stay will, in the event, be found to be correct. For the moment, we have, however, to deal with the coal plant; and the plan and section with which Mr. Allen has kindly provided us, together with the excellent photographs his son has taken of various portions of the new installations, will greatly assist in giving an idea of the general arrangement.

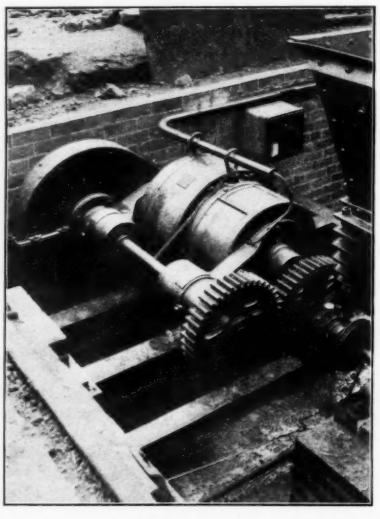
In the first place, one of the photographs will show the method of coal delivery. It is brought in waggons on to the private sidings of the works from the London and North-Western Railway, and is emptied, through the waggon side doors (which rest on a frame) direct into a breaker, capable of dealing with 30 tons an hour, and constructed by Messrs. W. J. Jenkins and Co., Limited. If the coal does not require breaking—and with the Fiddes-Aldridge machine there is no necessity for any great reduction in size—the arrangements permit of it being bye-passed immediately into the boot of the elevator. The breaker is driven by a Crompton 16 brake horse power electric motor, of 650 revolutions per minute, shunt wound, and of the entirely enclosed type. From the boot, the coal is raised by a bucket elevator (48 feet centre to centre), also of a capacity of 30 tons per hour. The elevator delivers the coal through a shoot on to a bridge conveyor, of which a photograph is given during construction, while a second one illustrates it as quite complete, and roofed in with galvanized iron sheeting. This bridge conveyor extends from the elevator to the roof of the retort-house. It is of the push-plate type, and from centre to centre is 35 ft. 10 in. in length. At the top of a standard near the head of the elevator is a Crompton electric motor, of 8 brake horse power and 800 revolutions per minute, which actuates both the elevator and the bridge conveyor. A shoot passes through the roof of the retort-house; and this is the means of communication between the outside conveyor and the distributing conveyor running over the overhead hoppers in

the house. This conveyor is also of the push-plate type, and is 83 ft. 4 in. centre to centre, being driven by a Crompton electric motor of 4 brake horse power, and 950 revolutions per minute, situated at the far end of the conveyor. The whole of this elevator and conveyor work was constructed by Messrs. Gibbons Bros., to the engineer's specifications. The overhead hopper is a continuous one, and is capable of holding 90 tons, which is equal to a 24 hours' supply when the whole bench is at work. It may be mentioned that on the reconstruction of the bench in 1904, the buckstays were carried high enough to serve to support overhead hoppers, though then there was no idea of adopting the Fiddes-Aldridge machine.

The elevator and bridge conveyor, it may be noted in passing, will also serve the second house, when, as is fully intended, a stoking-machine is installed in it. It is seen that the coal-elevator, the coal-conveyors, and the oxide-conveyor in the purifier house are all driven by electric motors. The adoption of the Fiddes-Aldridge machine, with its compact electrical plant, enabled this to be done. Having the electrical plant, it was considered that the fullest possible use ought to be made of it; and very pleased indeed are Mr. Allen and the Works Manager (Mr. Godden) with the working. The original design incorporated a gas-engine for the operation of the whole of this conveying plant by gearing; but it was found that it would cost almost as much to work the conveyors by that means as in the present manner, besides which it is found that the arrangement of motors is more simple and less costly in maintenance than gearing.

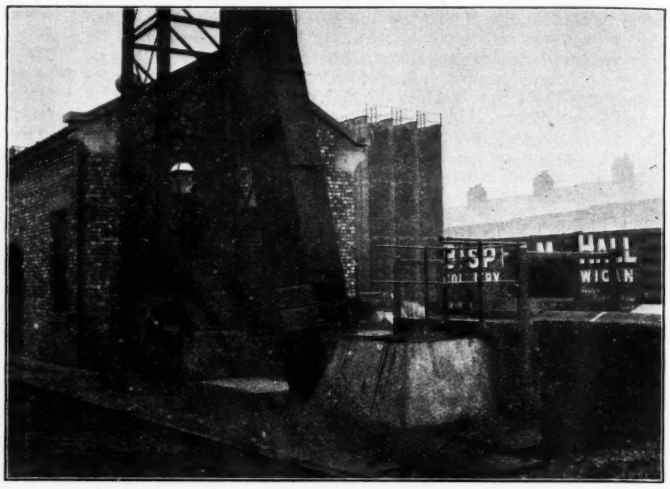
The Fiddes-Aldridge Machine and Its Working.

In this description of the application of mechanical coal feeding and charging and discharging on one of the latest principles, the coal has been brought to the overhead hoppers; and we have now before us the Fiddes-Aldridge machine. It is in appearance (as the photographs of Mr. Allen, jun., clearly show) much the same as the first working example of the machine that we saw in use in Pontypridd, and illustrated and described on Oct. 25, 1904. There is no gainsaying the fact that the machine looks a cumbrous thing; but its seeming cumbrousness is a necessity of the conditions under which it is made to work. Take away the chain wheel round which the discharger-charger (for brevity we will call it "chain") winds, and all the rest is modest in proportions and simplicity itself; and there appears to be nothing of a delicate nature about it to get out of order. The size of the machine—the main frame



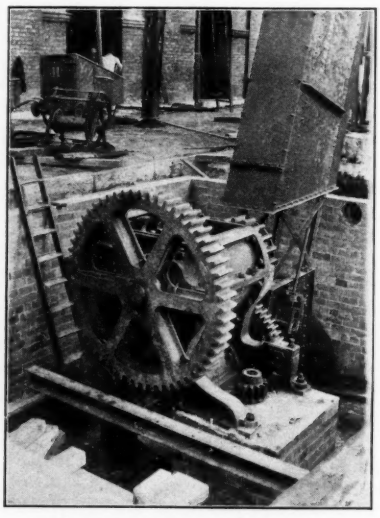
Electric Motor Driving Coal-Breaker.

is 12 feet high, the total height of the machine when charging the top line of retorts is 16 feet, and it occupies a space 5 ft. 9 in. wide and 12 ft. 6 in. deep—is in reality an aid to economical retort-house building and to economical working, through its performance of the dual duties at one stroke of emptying and recharging a retort. Here we have an instance of the adaptability of the machine to houses specially constructed for hand labour; and their name is legion. Its adoption and successful working in this case are proof that it can be put into any house where hand work has so far been the fashion. There must be a certain space between a retort-bench and the house wall for rake work in clearing only half a through retort; and this space is ample for the working of the machine. Indeed, in this case, while the former bench was only 18 feet wide, the new one is 19 feet; so that there has been a gain in carbonizing space. The internal measurement of the house is 54 feet wide; and taking 19 feet for the bench, we have from the face of the brickwork of the bench to the walls on either side a floor of 17 ft. 5 in. wide. The house, by-the-by, is 88 ft. 3 in. long. It is noticed that the face of the machine (which runs on rails in the retort-house floor) is about 4 ft. 1½ in. from the face of the retort-bench; and therefore just under 2 ft. 7 in. from the mouthpiece lids. Under these conditions, there is comfortable room for the working of the machine.



Delivery of the Coal to the Breaker and Elevator from the Railway Sidings.

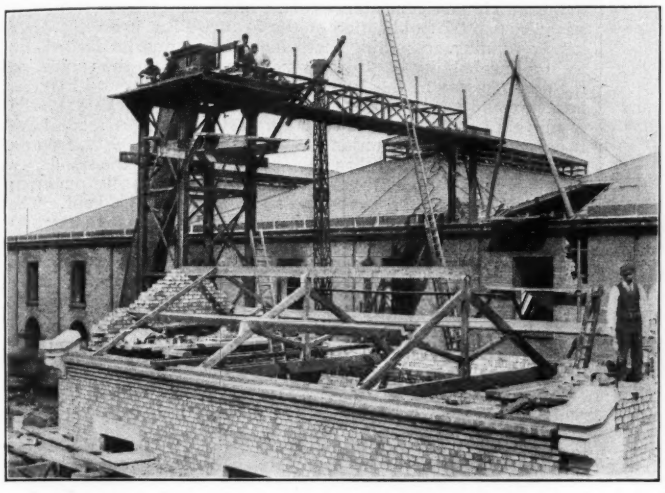
In principle, the machine is exactly the same as the one seen at Pontypridd; but there have been, as the result of experience, improvements effected in design generally. In the Pontypridd machine, everything was of cast iron; and this was admittedly the cause of much trouble. In the new machine (which has been at work at Wavertree for about three months) everything is now of steel. Temporarily, through pressure, the spur wheel was of cast iron; and, before a steel wheel was substituted in accordance with the specification, there was trouble. But since the steel wheel (which is built up of two parts) replaced the cast-iron one,



Electrically-Driven Coal-Breaker.

there has not been the slightest difficulty. In fact, the work now goes on regularly, with absolute smoothness and precision. The machine is a little heavier than the first example—approximately, 13 tons. The electric motor on the Pontypridd machine was smaller than that on the Wavertree one; but it did not work so easily. Here the motor is capable of affording 13½-horse power; and it performs the three operations of propelling the machine along the rails, raising and lowering the platform and working parts to the respective heights of the retorts, and operating the chain. Respecting the increased power of the motor, it was felt that it is better not to run any risk of the motor being strained and giving way; so that it was decided to err on the safe side, and to have plenty of power. The travelling speed up and down the house is about 40 feet per minute. In the operation of the machine, it is seen that there is automatic control everywhere, so that the man in charge cannot overrun.

There has also been an improvement in respect of the hopper on the machine, which has a capacity of 14 cwt. Instead of it travelling up and down with the operating part of the machine, it is a fixture; the feed to the chain being accomplished at the three working heights through a telescopic shoot, at the bottom of which is the measuring-chamber, which has a capacity of 8 cwt. This fixing of the machine hopper makes a considerable difference to the lifting work that the motor has to perform. In future constructions, it has been suggested that the measuring-chamber should be transferred to the top of the shoot, as this would enable the men to work quicker. The question is one for future determination; but it can be said that the present system will not be adhered to. Through a sight-hole lighted by an electric lamp attached to the measuring-chamber, the operator can readily see the quantity of coal that is being admitted.



Elevator and Bridge Coal-Conveyor in Course of Construction.

Concerning the portion of the machine that travels through the retorts, and which we have been describing as the "chain," as readers are aware, it is practically a push-plate conveyor, which is driven into the retort by the movement of the large wheel, and is withdrawn and wound on to the wheel by the opposite movement of the latter. This portion of the machine acts at once as a ram for clearing the retort in its progress, and a carrier of the charge of coal, which it deposits in the retort, in an even layer, upon the return journey. The chain is simply built up of two parallel rows of side plates jointed together, and with distance-pieces between, on which distance-pieces are flaps dividing the chain into compartments. These flaps push forward the coal, and on the return travel are lifted and caught up, there then being no resistance from the coal. In the original machine they were allowed to drag over the top of the coal, which brought a little forward into the mouthpiece, instead of allowing the charge to rest perfectly square in the mouth of the retort. It will be understood, from previous descriptions, that the floor of the retort forms, as it were, the bottom of the conveyor; the space between the machine and the mouthpiece of the retort being bridged over by a flap hinged on the front of the machine. Another point is this: When the Pontypridd machine was inspected, it was observed that there was rather an unpleasant grating noise during the travel of the chain, and that there was a tendency to draw back a small amount of coal. But it was clear that these were only due to remediable mechanical defects, and that in any new machines they could be overcome. This has proved true, as is found in the smooth and practically noiseless operation of this Wavertree machine. The cause of the defects was that the wheel was formerly driven by driving bars, which engaged with projections on the side plates of the chain; and it was these projections (aided by the dragging of the flaps) that were responsible for the troubles referred to. There are now no projections on either the inside or the outside of the chain—the plates, in fact, are quite plain. There is a further matter that may also be mentioned here. On the introduction of the machine at Liverpool, it was at once found that the chain was of too small a capacity for the broken coal. At Pontypridd very fine coal is used, and a weight of 6 cwt. was easily accommodated by the chain as designed; but it was not suitable for Liverpool, with its larger coal. Since October, therefore, until a few weeks since, 5 cwt. charges have had to be used; and the chain worked without a single hitch with that quantity. During the Christmas holidays, a new chain was fitted; and this will take up to 7½ cwt. charges. At the present time 5½ cwt. charges are being worked, with 6 cwt. ones in the top retorts. A variety of coal is carbonized at Liverpool—consisting chiefly of Yorkshire, Wigan, and some amount of cannel. But in this particular bench, cannel has not yet been employed, since the arrival of the machine, as there is a desire to get quite at home under the new conditions by instalments.

In the examination of the machine, a point of precaution is noticed in connection with the platform. It is suspended by wire ropes; but an inch or two below each position of the platform for each horizontal row of retorts, recesses have been provided on the frame of the machine for the accommodation of a moveable bar, to prevent any accidental dropping of the stage. The outer frame by the way is built up entirely of strong steel members, and carries an inner frame, on which all the machinery is fixed.

Regarding the power for driving the machine, it is conveyed from the power-house (to be described presently) by wires which are carried along the retort-house wall; and the current is transferred to the machine motor by a "slipper" at the top of the machine. Owing to the comparatively small amount of space between the bench and the retort-house wall, the chains operating (by worm-wheels and rods) the outlet-slides of the overhead hoppers, are hung close to the wall, but contact with the electric wires is prevented by protecting rails formed of gas-tubing. In any future installation, however, arrangements will be made for the filling of the machine-hopper without the operator having to descend from his platform.

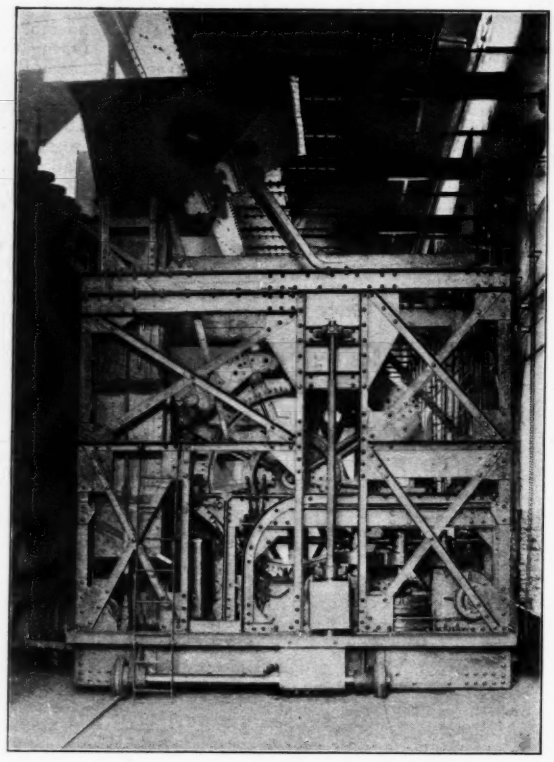
These are the points upon which improvement has been made in the machine; and, further than the reference to them, there is no occasion to again enter into any detailed description of the general construction. As in all mechanical devices for effecting certain work, improvement has come with experience. We cannot say what additional improvement may be in store; but that at Wavertree Mr. Allen has a machine that has now been satisfactorily discharging the dual duty of retort clearing and charging, over a period of about three months, we have his testimony, which is supported by our own witness. There is little that is left to the discretion of the operator in this machine. He has certain levers at hand to start and finish the various operations; and the machine does all the rest. Therefore a little training perfects any intelligent man's management of the machine. The man in charge and the lidman were seen on our visit performing with the greatest facility, their simple functions. It may here be well to recall the fact that the 54 retorts in this house had, at the time the machine was put into use, been at work for twelve months. Inspection showed that the heats were such as give delight to the responsible manager, the charges were uniformly placed in the retorts, and found to be well burnt off, and several retorts were seen cleanly discharged and charged, without a single hitch. The machine was brought before the retorts, the bridging flap lowered, and by the simultaneous movement of a couple of levers the chain began its travel, being filled as it passed below the shoot with its burden of coal. When its length had passed through the 19 feet of the retort (driving by its head the spent charge before it) and returned home, the exhausted charge had been replaced by the new. "Could anything work sweeter?" asked one of the witnesses; and "Could we reach a higher degree of perfection with horizontal retorts than to have them discharged and charged in one operation?" The whole discharge and charging was accomplished in several retorts in from (in each case) 38 to 45 seconds.

Bridge Conveyor as Finished and Covered.

There has been some speculation as to the effect of the heat upon the chain. The three months' working at Wavertree has not so far disclosed any ill-effect. In short, the cold coal is the salvation of the chain.

The Removal of the Coke.

There is one point that we have not yet touched upon, and that is the removal of the coke as it falls from the retorts. The coke is received in barrows, each capable of taking a charge, and quenching and removal to the coke bank is done by hand—excepting, of course, in the case of the portion required for fuel, which (on the one side) is allowed to fall direct into the producers. As a matter of fact, coke-conveyors have no part in the operations at Liverpool; as they do not appear to offer any advantages on the



Fiddes-Aldridge Retort Discharger-Charger—In Position for the Bottom Retorts.

score of economy, having regard to the local circumstances. To Mr. Allen, wear and tear appears to be great, and ill-treatment to be unreasonably meted out to the coke by this method of transport. Therefore, it may be taken that the practice of man and barrow is not likely to be discarded at Liverpool in the near future. It was noticed that the discharger-charger ejects the coke from the retorts in large size; and in this form it is deposited on the coke heap.

Producers and Ascension-Pipes.

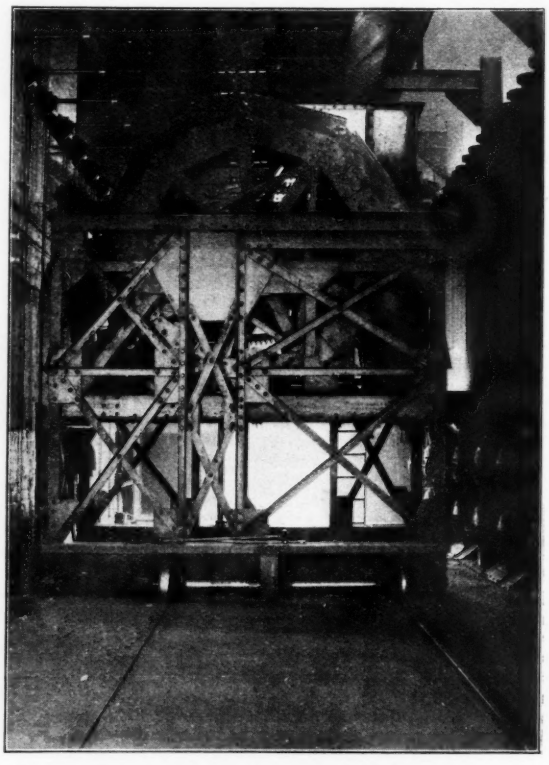
In connection with this question of coke, there is a practical point for consideration and avoidance in future installations. In this house, there are producers on each side of the bench; and this necessitates, with the new system of working, the wheeling round of coke to the machine side of the bench. For Eccles Street, settings have been designed with producers on one side only; and with the further interesting point that the gas is to be drawn off from only one side of the bench—substituting 8-inch ascension-pipes for the 6-inch ones. Experience with the inclined system has satisfied Mr. Allen that there is no harm to be feared in drawing the gas off from one end of a through retort by means of a large ascension-pipe, rather than from each end by smaller ones.

The Power House.

After this little digression, we must pass outside the retort-house again, to the electric power house, which is situated hard by the spot where the coal is received. The building will be seen in course of construction, as well as completed, in certain of the photographs. It is a brick building, with open roof, and pitch-pine principals, and its internal dimensions are 37 ft. 8 in. by 17 ft. 3 in. Its interior is light and pleasing, having plastered walls, with dado of white enamelled bricks. It only contains at present one set of electrical plant; but provision has been made for duplication. The plant consists of a Crossley high-speed electric light gas-engine, U.E. type, of 49 brake horse power, and 220 revolutions per minute, with magneto-electric ignition, and Crossley's patent starter. For measuring the gas supplied to the engine, one of Mr. George Helps's "Equitable" meters has been adopted. This has been tested against an ordinary meter; and its working is well spoken of. The dynamo (which is directly coupled to the gas-engine) is one of Crompton's 31 kilowatt, 220 volts and 140 amperes, multipolar direct current, and shunt wound. Of course, there is a switch-board, and everything complete for controlling the current to the several plants that are electrically operated. It is a compact plant, and is giving much satisfaction.

A Question of Costs.

It has been seen that the working of this installation has to be compared with the working costs of the same house under hand labour; and, apart from the saving effected considered in relation to the individual circumstances of the house, there is no particular advantage in the publication of the figures. But upon this, after longer running, something more may be heard from Mr. Allen; as in all probability he will be reading a paper on the subject at the next meeting of the Institution of Gas Engineers. Figures, in fact, could not be published yet, as it will have been gathered from what has been stated that the various changes made have necessitated an interruption of normal working. But, from a week or two since, work has been proceeding with the regularity that it is now confidently expected will be constantly pursued; and from this date an exact record of costs will be kept. The restricted conditions, however, do not allow the plant to exert its full economical effect, seeing that the charger-discharger is only dealing with 54 retorts, whereas the fair capacity of the machine is more like 100 retorts. There is a proposal to give one of these machines a trial at the Eccles Street works. If this comes to pass, the machine will be better able to give a true account of its

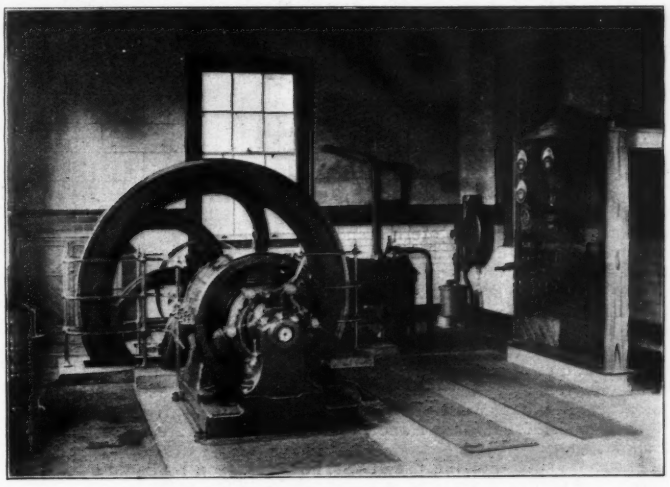


Opposite View of the Fiddes-Aldridge Retort Discharger-Charger.—In Position for the Top Retorts.

capability, as there it will have an opportunity of dealing with 84 retorts; and costs, as a consequence, will at once come down. It must be remembered that, in addition to hand labour, there has been a long experience with stoking machinery and inclined working at Liverpool. And, considering this experience, it can be definitely said that over former horizontal working there will be a saving. But Mr. Allen is not at all sanguine that there will be much cheaper working by the new machine than is found in the case of the inclined retorts. Inclined retorts, however, could not be put into the oldest of the Company's houses; and, in fact, it is only at Linacre and Athol Street that there are stage houses. On this question, too, of costs, Mr. Allen points to the difficulty of comparing the cost of the working of one town with another; and he calls attention to the remarkably low figures that have been published by some engineers. But on inquiry he has found

that these low costs have been obtained by exceptional working—as, for instance, only two gangs being employed in twenty-four hours, as compared with three eight-hour gangs. Therefore, in his opinion, it is rather a question for every engineer to consider what one machine or method will do in his own particular circumstances as compared with other machines or methods; and *primâ facie* in horizontal working, if one machine will do the work of two and in less time, then there must be a saving in wages and other expenses.

Acknowledgment has to be expressed to Mr. Allen for his kindness in giving facilities and other assistance in presenting to the gas profession this account of a new introduction of such great promise and interest. Naturally, there have been many inquiries for information, seeing that this is only the second working installation that has been made. This statement, which we have endeavoured to make as explicit as possible, will no doubt go far to satisfy those engineers who are desirous of knowing the latest experiences with the Fiddes-Aldridge machine in clearing and charging retorts at one stroke.



THE ELECTRICITY-GENERATING PLANT.

PERSONAL.

Mr. E. GEORGE HUTCHINSON, son of Mr. W. W. Hutchinson, of Barnsley, has been appointed Assistant Gas Engineer to the Stockport Corporation.

Mr. E. W. WILLIS, a Councillor and a Justice of the Peace for the City of Rochester, and also a Director of the Brompton, Chatham, Gillingham, and Rochester Water-Works Company, has been appointed a Director of the Rochester, Chatham, and Strood Gas Company in place of Mr. J. T. Prall, who died recently, after having been a member of the Board for twelve years, during eight of which he filled the office of Deputy-Chairman. Mr. Willis's late father was likewise a Director of the Gas Company a few years ago.

Mr. ROBERT H. BROWN, having secured an appointment on the engineering staff of the South Shields Gas Company, has resigned the office of Vice-President of the London and Southern District Junior Gas Association, of which he (in conjunction with Mr. Campbell, now at Devonport) was one of the promoters. He has always taken an active part in the proceedings of the Association, and has certainly done his best to promote its welfare. Mr. Brown received his training in the works of Messrs. Bryan Donkin and Clench, and at the schools of the Goldsmiths' Company at New Cross. He has since had considerable experience in gas engineering with Messrs. S. Cutler and Sons, Mr. A. F. Phillips, and Messrs. Stevenson and Burstal, whom he has now left to go to South Shields. He some years ago passed the City and Guilds of London examinations in "Gas Manufacture."

We understand that M. PAUL SOLANGES has retired from the position he has held for so long as Manager of the Milan gas undertaking belonging to the Union des Gaz. The local papers refer to this voluntary retirement, after a connection of some thirty years, with much regret, with which all who know M. Solanges will heartily desire to associate themselves. His literary work is also referred to appreciatingly—such as his own verse, translations into French of Boito's operas "Mefistofele" and "Falstaff," and other books. We sincerely wish M. Solanges every happiness in his well-earned leisure, and trust that his literary output will be further increased. The vacant position has, it is reported, been filled by appointing M. Lacombe, who is an Engineer of the Ecole Polytechnique of Paris, and who but a short time ago was, we believe, an officer in the French army.

We are pleased to announce—and we are sure many of our readers will participate in the feeling—that on Monday last week Mr. HENRY O'CONNOR, Assoc.M.Inst.C.E., was elected a Fellow of the Royal Society of Edinburgh. Mr. O'Connor is well known in the gas profession, not only from his papers and lectures, and also his useful "Gas Engineer's Pocket-Book," which has reached a second edition, but from his connection with the firm of Messrs. James Milne and Son, Limited. Mr. O'Connor is a Past-President of the Society of Engineers, whose transactions he has enriched, in addition to his Presidential Address, by three papers—one on "Machine Stokers for Gas-Works," another on "Pile-Driving," and the third on "Automatic Gas Station Governors." We very heartily congratulate him on his election, which is regarded as the highest honour which can be conferred in Scotland for one of scientific attainments. Indeed, we believe it is somewhat rare for anyone not possessing a university degree to be admitted.

It is not often that we have to record the elevation to the Bench of a member of the Bar so closely identified with the gas and water industries as is Mr. J. FLETCHER MOULTON, K.C., whose appointment as one of the Lords Justices of Appeal, in place of the Right Hon. J. C. Mathew, resigned, was announced on Friday. Up till the recent Dissolution, Mr. Moulton had represented the Launceston Division of Cornwall in Parliament; and the fact that he did not offer himself for re-election gave rise to a rumour which, though declared at the time to be unfounded, has now been verified. The new Lord Justice of Appeal was born in 1844, and, after a brilliant career at college—being Senior Wrangler and First Smith's Prizeman in 1868—was called to the Bar at the Middle Temple, of which he is a Bencher, in 1874, and took silk in 1885. In November of that year, he appeared for the defendant in the well-known case of *Otto v. Steel*, tried by Mr. Justice Pearson, in which, with the assistance of one junior, he stood against the *élite* of the Bar—the present Lord Chief Justice, Aston, Hemming, and Horace Davey. He was not then successful; but his defeat was fully compensated for later. Conspicuous features of his career were his conduct of the Welsbach litigation and the case for the Metropolitan Water Board in the arbitration proceedings connected with the transfer of the Companies' undertakings. Mr. Moulton is a Fellow of the Royal Society, and has been a member of the Senate of the University of London since 1895. He was President of the Institution of Junior Engineers for the session 1903-4, and delivered an interesting Inaugural Address on "Inventors and Invention." He took his seat yesterday in Appeal Court No. 1, with Lords Justice Vaughan Williams and Stirling.

OBITUARY.

After being totally incapacitated for five years by paralysis, Mr. R. D. COMMANS, who was formerly Chairman of the Bath Gas Company, died at his residence in the city on the 14th inst., at the age of 82. Mr. Commans for many years sat in the Town Council for St. Michael's Ward, and was elected an Alderman in 1890, resigning after his illness. He was also a Magistrate for the city.

The death is announced of Alderman GEORGE BAGOTT, of Dudley, who was for many years Chairman of the Streets and Gas Committee of the Corporation. Deceased, who was 81 years of age, found great fault with the charges made by the local Gas Company, and he constantly urged the Council to go in for electricity, long before the existing municipal electric undertaking was established.

We regret to record the death of Mr. DAVID WILLIAMSON, the Manager of the Clones Gas Company. Mr. Williamson joined the North of Ireland Association of Gas Managers on its formation, and was a member of the Irish Association (its successor) at the time of his death. At the funeral, which took place last Wednesday, the Hon. Secretary of the Association (Mr. James Whimster) was present to represent it.

On the afternoon of the 20th inst., the death occurred at Liverpool, at the advanced age of 86, of Mr. ALEXANDER DUNCANSON, M.Inst.C.E., who for some time was Borough and Water Engineer to the Corporation. In 1845, he entered the service of the Bootle Water Company; and when the undertaking (with that of the Harrington Water Company) was acquired by the Liverpool Corporation, he was appointed Assistant-Engineer. In 1869, he had entire charge of the home supply. Mr. G. F. Deacon was appointed Borough and Water Engineer in 1872—Mr. Duncanson being his deputy; and when, in 1881, he relinquished the position in order to devote more attention to the construction of the Vyrnwy works, Mr. Duncanson was promoted to the higher post. He discharged the duties till 1890, when impaired health compelled him to seek relief from them; and he retired at the age of 71. He is survived by two sons and a daughter; one of the former being the Assistant Water Engineer of the city.

GASHOLDER GUIDANCE.

Another Radical Departure in the Columnless Type.

PART I.

By W. GADD, F.R.M.S.

A very little investigation of the history of gasholder construction reveals the fact that, from its first clear conception until the late eighties, the development of the means for guiding and supporting the floating bell employed for storing gas, followed strictly the lines of what may be termed normal mechanical evolution. We first observe three or four stout columns arranged round the tank—whether circular or square—from the tops of which the bell or holder was suspended by chains or the like, and attached thereby to balance-weights, for purposes and in manner well known to gas engineers. As time went on, and as the necessity arose for holders of greater capacity, the number of columns was increased, and girders were added at the upper part for the purpose of bracing them together for mutual support and defence against the action of lateral wind pressure, which was quite early found to be of considerable importance, even with a moderately small installation.

The rapid spread of the use of gas, however, soon rendered it imperative that far larger structures should be designed; and, as a consequence, not only did the number of columns increase, but there came a tendency to place them relatively nearer together, if individually they were lightened, and intermediate girders, as well as diagonal ties from one to another were introduced. From this time onward, the gradual progression towards a light lattice guide-framing is easily seen to be of a normal and quite obvious character. Furthermore, the necessity for the old balance-weights disappeared, for reasons well understood, and may be dismissed as forming no part of this present consideration.

Somewhere about the year 1887 a question was raised among gas engineers, at the instigation of Mr. Webber, as to how far, if at all, the height of this conventional guide-framing could be safely reduced, without materially affecting the safety of the gasholder during its rise and fall, or the stability of the framing itself. The subject created great interest at the time, and was very exhaustively discussed by many leading engineers, in the columns of the "JOURNAL." It was generally concluded, and very properly so, that as the framing of a holder was the sole effective resistance to the overturning tendency of wind-action, any reduction of the height of the framing, relatively to the height of the holder itself, under the existing conditions, must necessarily be of a very restricted character, as the protrusion of the holder beyond the framing would convert the bell into an enormous lever, when under wind pressure laterally, having a power increasing with the amount of external projection. Nevertheless, where the framing is equal to the increase of the strain, it was decided that a reduction of height might safely be employed to a partial extent; and, as a consequence a certain number of what are known as "flying lifts" have been adapted to gasholders, in the manner invented and designed by Sir George Livesey.

In the midst of this controversy, it occurred to the writer to conceive of an entirely new departure in gasholder construction—by abolishing guide-framing entirely, and in lieu thereof, providing substitutionary means for supporting the bell, during its rise and fall, either at the base or else at the ground level of the tank. The considerations which led to the working out of this idea were doubtless of a simple character, although the simplicity of the problem was not by any means obvious, in the first instance. Nevertheless, by the process of reducing the subject-matter to first principles, it soon became apparent that if the bottom curb of an elevated holder were to be securely fastened to the sides or surface of a tank wall all round the circle, then the guide-framing could for the time being be entirely removed as a useless support; for the reason that any overturning tendency would be resisted totally at the base—the one half of the holder tending to lift the foundations in some direction, while the other half of it would be engaged in merely compressing the same in reverse.

It consequently became clear that if some means could be devised whereby this condition of basic resistance would be provided at all heights of a holder's rise and fall, and at the same time the necessary freedom of movement be ensured, the problem of abolishing guide-framing would indeed be solved—provided always that the means or mechanisms employed were simple and effective for the purpose in view. The first method whereby this end might be practically attained, was the now well-known spiral guide invention, which was patented by Gadd and Mason in 1887. Another solution, from the same source, by means of toothed wheel and wire rope or chain gearing, was completed about the same date. But from motives of scientific preference, as well as business policy, the same was not patented or made public until considerably later.

It is not the writer's present intention to comment upon this second invention, beyond expressing the opinion that the best form or adaptation thereof has never yet been put into practice. With regard to the earlier of these inventions, around which interest was first excited, it will be well within the memory of older readers with what grave doubts the proposal to support a holder entirely at the base during its rise and fall was received by gas engineers generally. Looking back, over a period of nearly 18 years, and judging from the literature of the period, it now seems probable that the author of the suggestion was looked upon rather as a visionary enthusiast, than as a practical and regularly trained engineer. Be that as it may, however, numerous objections were raised, as might naturally be expected, which were doubtless very justifiable from cautious motives of engineering conservatism.

Still, at least one professional gentleman of high standing very early perceived both the importance and the practicability of the proposal; and no doubt the approval of Mr. Thomas Newbigging largely influenced opinions of many others with less experience. But it was reserved for Mr. Mellor, a younger engineer, to dare to be the first to allow the plan to be put into practice at Northwich. When once the theory was demonstrated sufficiently, and under severe conditions, others were willing to follow so admirable a lead; and since then large numbers of holders without guide-framing—the writer does not indeed know how many—some of which are of fairly great capacity, have been erected, and the perfect stability of holders supported by spiral guides appears to be now fully acknowledged by probably the greater portion of professional engineers, outside as well as within the gas industry. Certainly, plenty of time has elapsed since their first introduction to have developed any weakness they might possess; but the conviction expressed by the writer many years ago, that a good basically supported holder must always be far more stable than one guided within framing, unless the framing is made very strong indeed, seems to be thoroughly accepted by most, if not all, who have adopted them.

That being so, it becomes important to ascertain whether finality has been reached in this direction, or whether a still further development is possible with regard to columnless gasholders supported by means of spiral guides. Before such an inquiry can be satisfactorily answered, it is essential to discover whether there is any point, connected with holders of this class, which can be considered as a defect, a shortcoming, an imperfection, or even a mere inconvenience, and which therefore calls for a remedy, if possible. So far as careful inquiry has been able to be made—both from users and manufacturers of these holders—there does appear to be one thing which, on occasion at least, has given rise to some trouble, although perhaps of a minor character. This is the screw-like or spiral motion itself which is given to the holder, in rising and falling, by the spiral guides supporting the structure.

As is well known, the surface of the water in any holder tank is liable, in the winter time, to become frozen over. Of course, such an event can and ought to be prevented for many reasons. But human nature is fallible; and should, unfortunately, such freezing be allowed to take place, and the standpipes be embedded in a sheet of strong ice, the twisting of the holder may result in pushing over the stand pipes, or in doing some damage to their joints. It has also been ascertained that, from a kind of æsthetic consideration, some few engineers do not like the twisting motion of the bell, as a motion *per se*, or, for some more occult reasons, object to any except a vertical motion being indulged in by a gasholder. The latter criticism might perhaps well be ignored as of no practical value; but ever since the possibility of damage—however remote the contingency—has been brought to the notice of the original inventor, the subject of this gyratory motion has had his most careful study. The result is that he is now permitted to make public the fact that a new invention, involving a further radical departure, has been made applicable to columnless holders, which will enable them, when supported by spiral guides, to rise and fall vertically, and that without interfering in the least with their stability at any part of the travel.

Possibly this new proposal may appear to some critics, at the first blush, as unlikely of fulfilment as did the original suggestion to some others of that day, and may for other reasons provoke some scepticism. But, at least, it probably will be thought worthy of careful examination on the part of competent engineers generally, as emanating from a not altogether untried man. In anticipation of some very natural questions, it may be stated that Mr. Mason will again be associated with the exploitation, and the patents will be in the original names. Further, it is believed that, after perhaps the first one or two holders (which are necessarily in all cases somewhat experimental in this regard), the cost of construction need not be made greater than that of the present type of spiral holder; and, in addition, the guides and guide-rollers will be just as capable of being readily got at and attended to, as in the existing examples.

Having given an outline of the nature of the proposed new departure, it appears desirable to continue this article in a second portion, when a full detail description of the means employed is intended to be presented to readers of the "JOURNAL."

Gas and Oil Engine Management.—We have received from Messrs. Crosby Lockwood and Son the second edition of a little book, bearing the above title, by Mr. M. Powis Bale, M.Inst.C.E., &c. Since the appearance of the first edition in 1903, gas-producers, chiefly on the suction principle, have been largely introduced; and as the author considered that these appliances would, in the near future, become as much adjuncts to gas-engines as boilers now are to steam-engines, he added a chapter illustrating a few of the many types used. He enhances the value of his book as a practical guide for both users of gas and oil engines and those who have to attend to them.

GAS PROVISIONAL ORDERS FOR 1906.

SEVERAL Gas Companies are applying to the Board of Trade or to the Local Government Board for Provisional Orders, the scope of which may be briefly indicated.

Board of Trade Orders.

The Charing and District Gas-Works, Limited, in an application, propose that their capital shall not exceed £6000, consisting of the capital already expended on the undertaking (amounting to £4000), and additional capital not exceeding £2000, with one-third borrowing powers. The maximum dividend is defined at 10 per cent. on the original capital, and 7 per cent. on the additional ordinary capital, or 6 per cent. on preference issues. In addition to the land upon which the works now stand, the promoters desire power to purchase, by agreement, lands to the extent of 5 acres. For gas of an illuminating power of 14 candles, a standard price of 4s. 6d. is proposed; and the sliding-scale is suggested on the basis of penny changes in price, in respect of any year, carrying alterations in dividend of 5s. per cent. on the 10 per cent. capital and 3s. 6d. per cent. on the 7 per cent. capital. Insurance and reserve funds are provided for; and it is requested that power shall be conferred to apply for an Electric Lighting Order. [*Parliamentary Agents: Messrs. Roberts and Co.*]

The Chichester Gas Company are adopting this procedure to obtain additional capital to the extent of £25,000, upon which the dividend is to be limited to 7 per cent. on the portion that is raised as ordinary capital, and 6 per cent. on any part issued as preference capital. Borrowing powers on the lines of the customary one-third are desired, with interest limited to 5 per cent. Relief from liability to forfeiture for sulphur impurities other than sulphuretted hydrogen is desired. The manner in which the Company have conciliated the City Council in respect to this clause of the Order was referred to in the "JOURNAL" last week, p. 236. [*Parliamentary Agents: Messrs. Blyth, Dutton, Hartley, and Blyth.*]

The Corsham Gas Company, Limited, define the limits within which the Order they are applying for shall be operative, as Corsham, Lacock, and Biddestone, in the County of Wilts. The money already raised is £3800 of original capital. It is now proposed that £1000, to be called "B" capital, shall be issued to the holders of the original capital rateably according to their respective holdings of capital; and the additional capital shall be £5000. The borrowing powers sought are only one-fourth of the amount of the capital raised, including the "B" capital. The dividends it is intended shall be limited to 10 per cent. on the original capital, 5 per cent. on the "B" capital, and 7 per cent. on the additional capital. Land purchase authorization (by agreement) up to 3 acres is asked. The illuminating quality of the gas is placed at 14 candles, for the testing of which Sugg's "London" argand is specified, or any other burner that may be approved by the Board of Trade. The price of gas is not to exceed 5s. per 1000 cubic feet. It is proposed, however, that at any time after the expiration of three years, the Board of Trade may, if they think fit, alter the maximum price or else give a standard price and sliding scale on the basis of penny changes of price carrying variations of dividend of 5s. per cent. per annum on the 10 per cent. capital, 3s. 6d. per cent. on the 7 per cent. capital, and 2s. 6d. per cent. on the 5 per cent. Then provisions regarding insurance and reserve funds will also apply. In respect of discounts, the Company will be satisfied with a limit of 15 per cent., whether in consideration of prompt payment or large consumption. [*Parliamentary Agents: Messrs. Torr and Co.*]

The Farnham Gas Company, Limited, stand in need of additional capital powers; and they ask for an extension by £22,000, provided that the share capital of the undertaking shall not, till further authority is obtained, exceed £49,200. On the additional ordinary capital, the dividend proposed is not to exceed 6 per cent., and 5 per cent. on the preference capital. Borrowing powers are suggested to be one-fourth of the issued capital carrying a rate of interest not higher than 4 per cent. or (with the consent of the Board of Trade) 5 per cent. [*Parliamentary Agents: Messrs. Sherwood and Co.*]

The Great Grimsby Gas Company are intent on adding new territory, by the annexation of the parishes of Humberstone, Weelsby (except so much of this parish as is included in the area of supply of the Cleethorpes Gas Company), Aylesbury, Healing, Stalleyborough, Immingham, Killingholme North and South, Ulceby, and Habrough, all in the County of Lincoln. Further lands are required; and it is proposed to take the right to purchase by agreement to the extent of 10 acres. [*Parliamentary Agents: Messrs. Deacon, Gibson, Medcalf, and Marriott.*]

Money powers are needed by the King's Lynn Gas Company; and they place their requirements at £12,000, with one-third borrowing powers. On such part of this additional capital as is issued as ordinary capital, the dividend is to be limited to 7 per cent., and on the preference capital to 6 per cent. Interest on money borrowed is to be restricted to 5 per cent. [*Parliamentary Agents: Messrs. Sherwood and Co.*]

An Order introduced by the Newport Pagnell (Bucks.) Gas and Coke Company proposes the conferring of additional capital powers to the amount of £3000—making the total capital £8000. The maximum dividends on the original capital are specified at 10 per cent. and 7 per cent. on the additional capital. The borrowing powers are suggested at one-third. Provision is made for a renewal fund; and for the purchase, by agreement, of lands to the extent of 3 acres. The Company suggest an illuminating power for their gas of 13 candles and specify the "Metropolitan burner No. 2" for use in testing the gas. Regarding the price of gas, 5s. 6d. per 1000 cubic feet is named; but provision is made for the alteration of this maximum price, after three years, if the Board of Trade think fit, or alternatively the application of the sliding-scale on the lines of penny increases or decreases lowering or increasing the dividends by 5s. per cent. per annum on the 10 per cent. capital and 3s. 6d. per cent. on the 7 per cent. capital. In the latter event, the creation in the customary manner of insurance and reserve funds is provided for. [*Parliamentary Agents: Messrs. Sharpe, Parker, Pritchards, Barham, and Lawford.*]

The Pontardulais Gas Company particularly define the limits of supply within which the Order they are applying for is to have effect; but, generally speaking, the area takes in part of the parish of Llandeilo-Talybont in the County of Glamorgan and part of the parish of Llanedy in the County of Carmarthen. The total share capital is named at £20,000—£5250 representing the ordinary share and loan capital ("A"), £2750 representing the amount expended by the undertakers out of revenue upon extensions and improvements of the undertaking (to be called share capital "B," and forming with "A" the original capital), and £12,000 additional capital. It is proposed that the share capital "B" shall be, in proportion to their respective holdings, divided among, and vested in, the several persons who immediately before the commencement of the Order were the registered members of the undertaking. Dividends are not to exceed 10 and 7 per cent. respectively on the original and additional capital, and 5 per cent. on the preference capital. The promoters desire the right to borrow up to one-third on the amount of the capital raised. Three acres is the extent of land for which power of purchase by agreement is asked. The illuminating power of the gas is specified at 13 candles, tested by Sugg's "London" argand No. 1; and the maximum price, at 5s. 6d., with power to the Board of Trade to revise it, at the end of three years, in the way already indicated in the case of other applications. [*Parliamentary Agents: Messrs. R. W. Cooper and Sons.*]

The Raunds Gaslight and Coke Company are seeking money and other powers. The capital is fixed at the round sum of £10,000, of which £5560 has already been expended on the undertaking, and the balance of £4444 is the sum which it is desired to raise as additional capital. The limit of dividend on the original capital is to be 10 per cent., on the additional capital raised as preference 6 per cent., and on that issued as ordinary 7 per cent. The amount of money which the undertakers may borrow is suggested at one-third of the total of the capital raised. Authority to purchase additional land up to 3 acres is sought. It is proposed to supply gas of an illuminating power of 14 candles, tested by Sugg's "London" argand, or such other burner as may be approved by the Board of Trade. The maximum price of gas is put at 4s. 9d. per 1000 cubic feet, subject to revision by the Board after the expiration of three years. [*Parliamentary Agents: Messrs. Lees and Butterworth.*]

The Redditch Gas Company are proceeding by Order for powers to construct further works and to raise additional capital. The new capital powers it is desired shall extend to £20,000—viz., £10,000 ordinary stock and £10,000 preference—with one-third borrowing powers on the total amount issued. The stock or share capital is not to exceed in the whole £80,000, until further authority is obtained. The standard rate of dividend is proposed at 5 per cent. Clauses are included referring to the excess charge in the case of prepayment meter supply—1s. for meter and fittings, and 6d. for meter alone, being specified. [*Parliamentary Agents: Messrs. Burchells.*]

The St. Austell Gas Company, Limited, define, in a schedule to their draft Order, their limits of supply as including the urban district of St. Austell and the parish of St. Austell rural. It is proposed that the share capital shall not exceed in the whole £15,000—consisting of 5000 shares of £2 each already created (of which 4500 have been issued, 2500 being fully paid, and upon 2000 £1 15s. has been paid); and 2500 shares of £2 each as additional capital. The borrowing powers sought are one-third of the total amount of capital raised. The standard dividend is placed at 8½ per cent., and the price of gas at 4s. 6d., with 5s. per cent. changes in the former on penny variations in the latter. Insurance and reserve funds are provided for. The limits of discounts for prompt payment and large consumption are suggested at 10 and 25 per cent. respectively. In addition to lands described in one of the schedules, the Company desire to be empowered to purchase, also by agreement, up to 2 acres. The excess prices named for prepayment supplies are to be 10d. for meter and fittings, 1s. if the fittings include a cooker, and 6d. for meter alone. The illuminating quality of the gas is proposed at 13 candles, tested by the "Wandsworth" 14-candle burner; but the gas is to be consumed at such a rate as will yield the maximum light for which the burner was designed. The table photometer and Harcourt's pentane 10-candle lamp are to be used in making the tests. [*Parliamentary Agents: Messrs. Burchells.*]

The Wath-upon-Dearne and District Gas Company, Limited, require money, and further lands. The proposal is to increase the share capital to £50,000, by obtaining authority to raise capital to the extent of £18,000, with borrowing powers to the amount of one-fourth. Two pieces of land are scheduled, which the Company wish to acquire (by agreement) for manufacturing purposes. [*Parliamentary Agents: Messrs. Milner and Bickford.*]

The Wollaston Gas, Coal, and Coke Company, Limited, desire that their area of supply may include not only the parish of Wollaston (excepting a small defined part) but the parishes of Strixton and Bozeat in the County of Northampton. The undertakers have already raised £4200 (to be known as original capital); and power to raise £7800 more will make the authorized capital £12,000. The maximum dividend on the original capital is to be fixed at 10 per cent., and on the additional capital at 7 per cent., excepting on the portion issued as preference capital, which may carry a dividend of 5 per cent. The borrowing powers are proposed at one-third of the total capital issued. In addition to the lands now occupied for manufacturing purposes, the Company may purchase by agreement up to 3 acres. The illuminating power of the gas is specified at 14 candles; and the maximum price at 5s. 6d. per 1000 cubic feet, with revision after three years or the application of the sliding-scale, if thought, or as may seem, fit to the Board of Trade. Limits of 10 and 15 per cent. are proposed respectively for discounts for prompt payment and large consumption. The "London" argand burner No. 1 is proposed for the testing of the 14-candle gas, or any other burner approved by the Board. [*Parliamentary Agent: Mr. John Kennedy.*]

Local Government Board Orders.

There are only three applications to the Local Government Board by Local Authorities for Provisional Orders.

The Audley District Council are, under an indenture of assignment (dated March 29, 1878) of the gas supply rights within the district of the Kidsgrove Gas Company to the then Local Board, the manufacturers and suppliers of gas within their district. The Order for which they are now applying is to give them extended powers in respect of the enlargement and renewal of their gas-works; the purchase by agreement or the leasing of lands; the purchase and letting on hire, sale, &c., of all apparatus required in the consumption of gas; and power to borrow, with the sanction of the Board, such sums as may be necessary for the purposes of the undertaking. [*Mr. J. J. Nelson, Clerk to the Council.*]

The Liverpool Corporation are applying for an Order to authorize them to construct and maintain works and manufacture and supply gas within the township of Fazakerley, which is within the city area. A piece of land is scheduled for gas-works by the side of the Lancashire and Yorkshire Railway within the township; and authority is requested, in addition, to the purchase of a further 10 acres. The gas intended to be supplied is to have an illuminating power of 20 candles, tested by a batswing or fishtail burner. In this respect, it is proposed that the supply shall be on a par with that of the Liverpool United Gaslight Company. The maximum price mentioned for gas is 4s. 6d.; and for public lighting it is not to be less than that charged to private consumers by more than 10 per cent. The money borrowed for the purposes of the Order are to be such amounts as may be sanctioned by the Local Government Board; the period of repayment being within fifty years. Separate accounts for the undertaking are to be kept. [*Parliamentary Agents: Messrs. Sherwood and Co.*]

The Marsden District Council—desiring to extend their gas undertaking, to purchase additional lands, and to borrow further money—are applying for an Order. Lands adjoining the present works, to the extent of 2986 square yards, are scheduled for purchase by agreement for manufacturing purposes; and authority is to be taken to acquire by agreement an additional 3 acres. Power is asked to the borrowing of money with the sanction of the Local Government Board, with a period for repayment not exceeding fifty years. The whole of the remaining clauses refer to financial matters. [*Parliamentary Agents: Messrs. Rees and Freres.*]

The Gas-Driven Canal Barge.—Writing to the "Standard" on this subject, Mr. A. J. Ash, the Chairman of Messrs. Fellows, Morton, and Clayton, Limited, of Birmingham, says his Company have many steam-propelled boats on the Grand Junction Canal which are showing better results than the gas-driven barge did on her recent trip (see *ante*, p. 171); but he is of opinion that, after sundry improvements, the barge will be an important development in the near future. To this end Mr. G. F. Twist, the Clerk to the Coventry Canal Navigation, has suggested that the propeller should be protected by an iron grill, which he says would minimize the trouble caused by floating *débris*, and also prevent choking by weeds in warm weather.

The Roumanian Petroleum Industry.—The Roumanian Senate has recently been occupied with a proposed law whereby the petroleum deposits in the country will be let out in the form of concessions for a period of fifty years to private concerns; the lots to be 100 hectares (nearly 250 acres) in extent for known petroleum-bearing lands, and 1000 hectares for unknown lands. According to the "Chemical Trade Journal," the conditions are somewhat as follows: One individual or firm may have as many as three concessions conditionally upon a deposit of 80,000 frs. per lot as a guarantee that the lands will be seriously exploited; while, on the other hand, no fusion of interests embracing more than three lots will be permitted under any circumstances. The State remains the sole carrying agency for the petroleum; and the revenue from the concessions is designed to be on a graduated scale, according to the importance of the output of the respective concessions,

WATER BILLS FOR 1906.

In preceding issues of the "Journal," the chief features of the Gas Bills for the ensuing session have been noticed. We now deal with the Bills which contain provisions relating to the supply of water.

The Accrington Gas and Water Board apply for power to construct additional works, consisting of a pumping-station, with a well, borehole, and adits, in the parish of Altham, and a line of pipes connecting it with the existing reservoir in the parish of Huncoat—all to be completed within a period of five years from the passing of the Act. The Board wish for authority to raise by loan £26,630 for carrying out the works specified, to be repaid in sixty years from the date of borrowing. [*Parliamentary Agents: Messrs. Lewin, Gregory, and Anderson.*]

The Bacup Corporation ask for an extension of the time limited by section 20 of their Act of 1898 for the completion of the works therein mentioned, for a period of three years from July 25, 1908. They also wish to be authorized to increase the water-rates within the borough and alter the dates for their payment. At present the Corporation are charging for water in accordance with the Rossendale Water-Works Act, 1853, and the Bacup Corporation Water Acts, 1853 to 1898; and they desire to raise the maximum by amounts ranging from £2 10s. down to 13s. 4d. per cent. per annum, depending upon the rack-rent or value of the premises supplied. Authority is sought for the borrowing of £50,000 for the completion of the Cowpe reservoir and other works sanctioned by the Act of 1898, and £25,000 for laying down mains and constructing filters and other works—both amounts to be repaid within sixty years from the date of borrowing. [*Parliamentary Agents: Messrs. Sharpe, Parker, Pritchards, Barham, and Lawford.*]

The Carlisle Corporation ask for power to acquire certain land for the purposes of their Geltsdale water scheme, and for an extension of time, until Aug. 12, 1910, for the completion of the works comprised therein. They also seek authority to borrow an additional £100,000 in respect of the scheme—making a total of £250,000. [*Parliamentary Agents: Messrs. Durnford and Co.*]

The Fulwood Urban District Council are seeking power to construct additional water-works, comprising an intake in the parishes of Chipping and Little Bowland, in the rural district of Clitheroe, an aqueduct or pipe-line to connect it with the existing Barnsfold reservoir, a new reservoir to be formed by means of an embankment across the valley of the Burnslack Brook, a road diversion, and an aqueduct or pipe-line from the Haighton reservoir to Fulwood. The Council undertake to pass 225,525 gallons of water into the brook daily as compensation. The works are to be completed within seven years from the passing of the Act. Authority is asked for the borrowing of £26,000 to carry out the works specified (to be repaid within sixty years), to alter the water-rates, and to make bye-laws for securing the purity of the water. [*Parliamentary Agents: Messrs. Lees and Butterworth.*]

As already intimated in the "Journal," the Glamorgan County Council are seeking various powers with respect to the supply of water in the counties of Glamorgan, Carmarthen, Cardigan, Monmouth, Radnor, and Brecon; and they have promoted a Bill to authorize them to "make inquiries and surveys with a view to the utilization of water supplies in South Wales, to form water districts," and for other purposes. The Council wish to have legislative sanction for joining with other South Wales District Councils to form a Joint Committee, to be called the South Wales Water Committee, for the purposes of the Act. It is proposed to limit the Council's expenditure on the "inquiries and surveys" already mentioned to £1000, and that of the Water Committee to £2000, in any financial year. Authority is sought to negotiate for a supply of water in bulk, and to create water districts, each to be under the control of a Committtee, who are to be regarded as a body corporate, with perpetual succession and a common seal. It is proposed that any Committee constituted by order of the Water Committee shall have power to borrow such sum or sums as the Local Government Board may approve, on the security of the contributions of the Local Authorities of the Committee, who are to be able to levy rates in connection with the water supply of their district. As soon as practicable after the constitution of a Committee, they are to prepare a scheme for the supply of water within their district, and state the basis on which the expense of carrying it out is to be apportioned among the Local Authorities. But no scheme is to be proceeded with until it has received the approval of the Local Government Board, who may direct inquiries in respect to it to be held by their Inspectors. The expenses incurred by the Council in carrying into effect the provisions of the Act are to be paid out of the county fund; those of the Water Committee, by the Councils appointing it; and those of the County, City, and Borough Councils, out of the city, borough, or district funds or rates. [*Parliamentary Agents: Messrs. Torr and Co.*]

The Heacham Water Company are applying to be incorporated, with power to supply water within the parish of Heacham and certain other parishes in the county of Norfolk. The capital of the Company is put down at £9000, in £5 shares; and borrowing powers to the extent of one-third are sought, as well as authority to issue debenture stock. It is proposed to make a well, a pumping-station, and a reservoir at Heacham, construct similar works in the parish of Sedgeford, and lay down three

conduits or pipe-lines, together with the necessary subsidiary works, all of which are to be completed within three years after the passing of the Act. The water is to be supplied under constant pressure, at rates ranging from 8s. 8d. per annum, where the rateable value of the premises does not exceed £5, and 10 per cent. where it does not exceed £20, per annum, down to 6 per cent. for houses above £80. For supplies by meter, the charge is not to exceed 1s. 6d. per 1000 gallons, with a minimum payment of 8s. per quarter. Provision is made for the sale of water in bulk, and for making bye-laws for the prevention of waste. The other provisions are those usually found in Water Bills. [*Parliamentary Agents: Messrs. Baker and Co.*]

The Holyhead Water Company require authority to construct new works, comprising an intake from the lake known as Llyn Traffwll, a pumping-station, and two lines of pipes, all of which they expect to complete within seven years from the passing of the Act. The Bill contains a large number of provisions for the protection of the estate of Lady Margaret Maria Verney. The Company will require additional capital to the amount of £40,000, including premiums, the maximum dividend payable upon which is to be 7 per cent., and power to borrow to the extent of one-third. The new capital is to be sold by auction or tender, and any not so disposed of may be offered to the shareholders, the employees, or the consumers. The Company wish to be authorized to supply water by meter and in bulk, on such terms as they may fix. [*Parliamentary Agents; Messrs. Lewin, Gregory, and Anderson.*]

The Kettering Urban District Council are applying for an extension of time for the construction of works and the acquisition of lands authorized by the Kettering Urban District Water Act, 1901, and also for authority to transfer the portion of their water undertaking in the parish of Weekley to the Kettering Rural District Council. For the first-named object, the extensions required are ten and five years respectively from the 26th of July next; and in regard to the second, confirmation is asked to a scheduled agreement made between the parties, and dated Dec. 5, 1905. When the Rural District Council are in a position to supply water within the parish of Burton Latimer from the Weekley works, they are to do so at the rates specified, which are based on the gross estimated rental of the premises, but in no case for less than 8s. 8d. per annum. They ask to be allowed to supply water by meter at a price not exceeding 2s. 6d. per 1000 gallons, or in bulk on such terms and conditions as may be agreed upon. The Rural District Council wish for authority to raise the amount necessary for purchasing the works indicated, constructing others, and defraying the costs and expenses of the Act—£14,000 being put down for the former purposes, to be repayable within fifty years from the time of borrowing. The Council undertake to keep separate accounts of the water undertaking. [*Parliamentary Agents: Messrs. Lees and Butterworth.*]

A General Bill promoted by the Kingston-upon-Hull Corporation contains one part relating to the supply of water. The Corporation ask for power to purchase and hold certain lands for the protection of the water and the works from which it is supplied against pollution, encroachment, or injury; and also to be relieved from the obligation to supply water to large institutions otherwise than by meter. The Bill includes a provision to the effect that where only part of a dwelling-house or premises is supplied, the whole must be paid for. The Corporation wish to be authorized to borrow £20,000 for the above-named purpose, to be repaid within sixty years. [*Parliamentary Agents: Messrs. Sharpe, Parker, Pritchards, Barham, and Lawford.*]

(*To be continued.*)

REDUCED PRICE OF THORIUM IN GERMANY.

An event of considerable importance to the incandescent gas lighting industry has just taken place in Germany, and it promised to be followed by another of almost equal significance to the trade. The former relates to the surprise sprung upon mantle makers on the 11th inst. by the Nitrate of Thorium Syndicate, who suddenly issued circulars announcing a reduction in price of practically one-half; the latter, to the prospect of the establishment of a price agreement representing all the mantle makers in Germany. This idea, we believe, has been abandoned. The fact may be recalled that for a period of two years the Syndicate has maintained the price of thorium at 53s., less 7 per cent., per kilogramme; and the unexpected reduction to 27s. caused a considerable amount of perturbation among mantle makers in general. As small rebates are also granted by the Syndicate, it follows that the present price of thorium is about the same as it was four years ago. The circulars intimating the introduction of the lower quotation did not afford any explanation of the action of the Syndicate, which has placed in an awkward position those firms who have stocks of any extent on hand.

It is well known that the Syndicate were only able to maintain the price at the high level it attained by reason of the agreement existing between them and the owners of the Brazilian monazite deposits, according to which the latter undertook solely to supply members of the convention with the sand for the chemical extraction of the thorium. On their part, the Syndicate pledged themselves to give the furnishers of the sand a share in their profits when the price exceeded 28s. per kilogramme, and during the currency of the agreement. The high price of thorium has, however, in the past two years, induced various firms to look about in order to see whether they could render themselves independent of the Syndicate. The action of the South Metropolitan Gas Company will come to mind. Certain small chemical works commenced to buy up the residuals or ashes collected in mantle factories, and worked them up into nitrate of thorium. In other cases, a large expenditure was incurred in obtaining monazite sand from North America as well as from the interior of Brazil. It was found that, notwithstanding the considerable cost, it was commercially remunerative to obtain small supplies from these sources for conversion into thorium.

The fairly large proportions gradually assumed by the utilization of external sources and of mantle factory residuals are believed to be one of the principal reasons for the reduction in price by the Syndicate, who began to experience a falling off in business that was not encouraging for the future. Another main reason is found in the fact that the agreement already referred to will expire on July 1, 1907; and by lowering the price to 27s. per kilogramme, it will be obvious that, as this rate is 1s. less than that which entitles the sand suppliers to any participation in the profits, it will no longer be necessary to "go shares" with the owners of the raw material. It is consequently hoped in Syndicate circles to recover the lost business, especially as the reduced price will render it scarcely possible for competitors to continue in existence. It is also expected, as contracts will retain the "falling-price" clause, to induce mantle makers to buy largely during the present year, and accumulate stocks, so that on the expiration of the agreement in July, 1907, the complete cessation in the supply of monazite sand would not affect the situation for a period of two years.

The calculations made by the Syndicate apparently leave out of consideration the probable action which may be taken by the monazite sand owners themselves next year. It is apparently intended to endeavour to bring pressure upon them to conclude a new agreement on terms which would be even more satisfactory than the favourable conditions under which the sand is obtained by the Syndicate at the present time. At any rate, it is premature to indulge in speculations, at this early period, as to the future.

The lower price of thorium naturally brings in its train the question of the price of mantles. It is recognized that, though thorium has been very high in the past two years, the rates for mantles have gradually fallen; and the reduction in the former has now brought it approximately to the right proportion which should exist between raw material and manufactured product. In these circumstances, it is considered that it would be impossible to make any immediate material reduction in the price of mantles. Any lowering of charges would result in heavy losses to those firms who have stocks of thorium on hand which have been paid for at about twice the existing rate.

Now that prices have come down to 27s., the Thorium Syndicate are offering prices for mantle ash; and those firms who formerly obtained thorium in this way can to-day buy thorium almost at the same price as they would have to pay for ash.

The Keeping of Local Authorities Accounts.

The President of the Local Government Board (the Right Hon. John Burns) has appointed a Departmental Committee, consisting of Mr. Walter Runciman, M.P. (Chairman), Mr. J. Bromley, C.B., Mr. T. Pitts, C.B., Mr. R. Barrow, Mr. E. P. Burd, Mr. J. J. Burnley, Mr. J. Gane, and Mr. F. Merrifield, to inquire and report with regard to: (1) The systems on which the accounts of Local Authorities in England and Wales are at present kept; (2) generally as to the system on which the accounts of the various Local Authorities in England and Wales should be kept, and, in particular, whether the accounts should be prepared on a system requiring the entries of receipts and payments to be confined as far as possible to actual receipts and payments of money or not; and (3) the regulations which should be made on the subject, regard being had to the necessity for showing accurately the amounts raised by local taxation and the purposes for which they are applied. Mr. G. R. Snowden, of the Local Government Board, will be Secretary of the Committee.

Reports of Gas Associations for 1905.—It will be seen, from an announcement which appears elsewhere, that this volume is now ready. It is a continuation of the series of collected transactions of the District Associations of Gas Engineers and Managers commenced in 1883, and it contains the reports of the proceedings of these bodies—including the newly-formed Institution for Wales and the Monmouthshire district—in the past twelve months. The volume is more bulky than its immediate predecessor—the matter occupying 588 as compared with 482 pages; and it is illustrated by 10 plates and 49 figures. A list of these is given, as well as an index to the contents. The technical matter is followed by lists of the officers and members of the several Associations. The volume, which is neatly bound in cloth, presents, in a convenient form for reference, the past year's work of the provincial organizations of gas managers, and consequently forms a companion to the Transactions of the Institution of Gas Engineers.

GAS PROFITS IN MASSACHUSETTS.

[Second Article.]

By Alton D. Adams, of Worcester (Mass.).

Under the theory set out in the cases previously reviewed, gas systems are supposed to act as a sort of savings bank, in which unwilling consumers, after paying the cost of operation, interest, depreciation, and a fair dividend, deposit per force a part of their surplus incomes to provide for future extensions. The legal title to these deposits is in the gas companies; but they are thought to be bound by some moral obligation, at least, to use the deposits as a sort of trust fund for the benefit of the consumers. Under a policy guided by this theory, some of the companies have prospered mightily. Naturally, consumers have not been greatly encouraged to petition for lower prices in places where the operating companies have paid dividends of about 10 per cent., no matter how large the net profits. It may be noted, in this connection, that gas-rates can only be reduced after a public hearing before the Commissioners, where the petitioners are presumed to show cause for a reduction. At such hearings, the companies are sure to be represented by Counsel and witnesses; and there must be a good probability of success to warrant similar expense on the part of the consumers. During the five years ending at the middle of 1896, the Commissioners gave seventeen decisions on petitions for lower gas-rates; in the five years since that date, only nine such decisions have been given.

In both earlier and later years, some cases have come up that have not been pushed to a final hearing. A notable instance of large profits with no final hearing on the question of price exists at Lowell. In that city, the annual net profits of the Gas Company averaged about 24 per cent. on the capital stock during the five years ending with 1900. A similar instance is found at Taunton, where the annual net profits between 1888 and 1900 ranged from 21 to 28 per cent. From 1897 to 1901, the annual net profits of the Jamaica Plain Company have averaged about 18 per cent. The Worcester Company earned an annual net profit of about 20 per cent. during the five years ending with 1900. At Northampton, the yearly net profits of the Gas Company ranged from 19 to 25 per cent. on the capital stock during the seven years following 1893. During the period from 1888 to 1901, the net profits of the Haverhill Company were 24 to 25 per cent. in ten years, 30 to 37 per cent. in six years, 40 to 47 per cent. in four years, and 52 and 69 per cent. in two years respectively. From these net profits, as well as those of the less prosperous companies, some deductions should be made to cover depreciation. Depreciation charges as actually made by the companies left the following figures for surplus:—

Company.	Surplus, 1887.	Surplus, 1901.	Percentage of Surplus to Capital.	
			1887.	1901.
Brockton	$12,633·72	$21,136·76	19·7	11·8
Cambridge	185,136·79	371,458·17	26·4	53 0
Chicapee	34,638·00	29,825·48	115·4	47·7
East Boston	53.355·57	73,206·08	24·2	33·2
Fall River	16,967·57	190,601·58	5·8	42·3
Gloucester	25,872·01	26,313·74	41·5	32·8
Haverhill	16,878·07	346,028·09	22·5	461·3
Jamaica Plain	43,172·20	65,337·14	21·5	26·1
Lowell	110,018·65	316,810·01	22·0	48·9
Malden	26,348·74	94,162·37	15·4	28·1
Marlboro'	18,402·11	23,264·77	36·8	46·5
Northampton	14,340·70	34,886·18	28·6	46·5
Pittsfield	46,499·69	73,631·42	74·3	117·8
Quincy	679·09	5,112·01*	2·6*	15·4*
Salem	88,332·88	102,162·15	29·4	34·0
Springfield	126,828·93	216,413·15	25·3	43·2
Taunton	24,559·40	55,625·57	30·6	34·7
Woburn	39,841·82	43,535·55	88·3	96·5
Worcester	106,341·14	208,221 68	21·2	34·7

* Deficit.

Seventeen of the nineteen companies show an increase of surplus between 1887 and 1901, and for fifteen the percentages of surplus to capital stocks are greater in the later than in the earlier year. In 1887, the largest surplus was that of $185,000 at Cambridge; Springfield followed with $126,000, Lowell with $110,000, and Worcester with $106,000. In 1901, the Cambridge Company had a surplus of $371,000; the Haverhill, of $346,000; the Lowell, of $316,000; the Springfield, of $216,000; the Worcester, of $208,000; the Fall River, of $190,000; and the Salem, of $102,000. Between 1887 and 1901, the percentage of surplus to capital stock rose at Worcester from 21 to 34, at Springfield from 25 to 43, at Lowell from 22 to 48, at Fall River from 5 to 42, at Cambridge from 26 to 53, at Haverhill from 22 to 461.

The gas companies have gladly acquiesced in the theory that consumers should pay enough to provide for future extensions of their plants. The other theory, that consumers have a claim on the surplus funds they have contributed, has not found so much favour. True, the companies have not generally denied this theory; but the past acts of some of them give a hint of the future policy of others. At the middle of 1892, the Woburn Company had accumulated a surplus of $45,210·11, though the capital stock was only $45,100; and during the following year they paid a dividend of 37 per cent. In spite of the statement by the Gas Commissioners, in 1893, that the East Boston Company were under obligation to use their surplus for the benefit of the public, the Company paid dividends amounting to 30 per cent. on the $220,000 of capital stock in 1895. Dividends of 59·5 per cent. on the capital of $30,000 were paid by the Chicapee Gas Company in 1896. After paying dividends of 12 per cent. or more in each year since 1887, the surplus of the Company at Lowell stood at $252,985 in 1897; and during the following year a dividend of 22 per cent. was paid on the $500,000 of capital stock. At Worcester, in 1901, the gas surplus stood at $208,221·68; and the Company paid dividends amounting to 18 per cent. on their capital stock.

Surplus in the accounts of the Haverhill Company stood at $204,973 in 1897, and something had to be done. The succeeding year, a dividend of 50 per cent. on the capital stock was paid. This was followed the next year by a dividend of 20 per cent.; and in 1900 by one of 30 per cent. So that a sum equal to the entire capital was returned to the stockholders in three years. Even these unusual dividends were less in amount annually than the net profits of the Company; and other means were adopted by the stockholders to transfer the accumulated surplus to their own pockets. The Haverhill Gas Securities Company was chartered, under Massachusetts law, in July, 1899, to purchase, hold, and sell the stocks and bonds of other corporations of the Commonwealth. The promoters of this Company had arranged, before its incorporation, to purchase the entire capital stock of the Haverhill Gas Company, which had a par value of $75,000. As required by law, the capital stock of the Securities Company, to the full amount of $500,000 par value, was paid in cash. This $500,000 cash was then at once handed over to the stockholders of the Gas Company for the $75,000 of stock. A surplus amounting to more than five times the original investment of the stockholders in the Gas Company was thus divided between them in cash. The next move on the part of the Securities Company was to sell 5 per cent. debentures to the amount of $500,000 with the $75,000 of gas stock deposited with a Trustee as security. The public were thus made to contribute the entire amount paid by the Company for the gas stock; and the promoters remained in a position to manipulate the stock to their own advantage. On this state of facts, the Gas Commissioners recommended that the Legislature should annul the Charter of the Securities Company; but a Bill for this purpose, passed by the House in 1900, was rejected by the Senate.

The gas consumers at Haverhill noted these divisions of surplus, and the Mayor of the city, pursuant to a vote of the Council, petitioned the Commissioners for a reduction from $1 per 1000 cubic feet, the net price of gas in 1899. At the hearings on this petition, it was brought out that the Gas Company was organized and began to supply gas in 1853. The original capital was $45,000; but this was increased to $75,000 in 1871. Since its incorporation, the Company had enjoyed a monopoly of the gas supply in Haverhill, and, in addition to the payment of dividends, had accumulated a surplus of $330,992·66 on June 30, 1900. The Commissioners stated that the surplus was much greater than could be utilized to make improvements in the existing plant; and they reduced the net price of gas to 80 c. This reduction in price was to take effect on Feb. 1, 1900; but the Company refused to accept the recommendation of the Commissioners, and a formal order was served on them at the date named. Shortly thereafter, the Company brought an action in the Circuit Court of the United States to restrain the Commissioners from enforcing the order reducing the price of their gas. The Bill of the Company stated that the price fixed for gas by the Commissioners was so low as not to cover the cost of manufacture, the depreciation of plant, and reasonable profit. For this reason, the order was alleged to be in violation of the fourteenth amendment of the Federal Constitution. The Commissioners demurred to this Bill; but the demurrer was overruled, and the restraining order against them was granted. Meanwhile, the Haverhill Company have not reduced the price of gas, and the next move of the Commmissioners must apparently be either to drop the case or go to trial on the merits.

Such a trial must involve a question of paramount interest—namely, whether a gas company are entitled to charge rates that cover not only the cost of operation, but also depreciation charges and a fair profit on the structural value of the plant. As a general statement, the answer to this question must be in the affirmative; and this answer is amply supported by a line of decisions in the Supreme Court of the United States. This is not the place for an exhaustive review of these decisions; but their more important points for present purposes are affirmed in *Smith v. Ames* (169 U.S., 466) decided March 7, 1898. In this case, the constitutionality of an Act passed by the Nebraska Legislature to fix maximum freight rates on the railways in the State was involved. The Court here pointed out that "the duty rests on all Courts, Federal and State, when their jurisdiction is properly invoked, to see to it that no right secured by the supreme law of the land is impaired or destroyed by legislation." Speaking of the way in which reasonable rates are to be determined, the Court, in the case just mentioned, said:

> The basis of all calculations must be the fair value of the property used by it [the Railway Company] for the convenience of the public; and to ascertain the value, the original cost of construction, the amount expended in permanent improvements, the amount and market value

of the bonds and stock, the present as compared with the original cost of construction, the probable earning capacity under the particular rates prescribed by statute, and the sum required to meet operating expenses, are all matters of consideration, and given such weight as may be just and right in the case. What the Company is entitled to ask is a fair return on the value of that which it employs for the public convenience; and what the public is entitled to demand is that no more be exacted from it for the use of a public highway than the services rendered by it are reasonably worth.

But it may be suggested that, admitting the right of a company to charge rates which yield a fair return on the value of their property as a general rule, a company have no right to exact from the public a return on past earnings that have been invested in the plant without an increase of capital stock. This suggestion, however, seems to have no support in law or in logic. When a corporation have legally earned a specific sum, that sum is their absolute property, no matter how unreasonable the rates by which it was acquired. Net earnings having once come into the treasury of a corporation, they may be paid out directly as dividends, or invested in interest-bearing securities or in extensions of the company's plant. If the net earnings are invested in securities, it will hardly be denied that the corporation are entitled to the interest. How then can it be thought that investment of net earnings in extensions of the plant belonging to a company robs the shareholders of the right to a reasonable return? By what act do the company relinquish their right to make a profit on earnings invested in the plant? If this reasoning is correct, the millions of dollars in surplus represented in the gas plants of Massachusetts are entitled to earn dividends, and no Commission or Legislature can enforce rates that destroy this right. It follows that the policy of the Commissioners which permits gas companies to charge rates which more than cover the cost of operation, depreciation, and a fair return on the value of a plant, can only result in permanent injustice to the consumers. As to the theory that gas companies are bound, by some moral obligation, to use their surplus for the public benefit without a return, little need be said. Gas managers and stockholders, like the general public, are not philanthropists. If permitted to accumulate surplus funds, whether invested in the plants or in some other way, the companies are quite sure, sooner or later, to turn these funds into the pockets of the stockholders. This may be effected by the payment of large and special dividends, as was done by the Chicapee, Woburn, Worcester, East Boston, Lowell, and Haverhill Companies; by sales of stock, to which the owners of the Haverhill Company finally resorted; or no doubt by other means invented to meet the exigencies of future situations.

A hint may now be obtained as to the probable outcome of the pending suit of the Haverhill Company. It should be noted that, in any event, the stockholders of this Company have got $500,000 for their property, although the original investment was only some $75,000. The bondholders of the Securities Company have, in effect, paid $500,000 for the property of the Gas Company. This seems to be some evidence as to the value of the undertaking. According to the report of the Gas Commissioners, the assets of the Company amounted to $438,862·52 on June 30, 1901. This is further evidence, though, like the foregoing, not quite conclusive. During the year ending at the date just named, the net profits of the Haverhill Company amounted to $24,405·45, with no allowance for depreciation. The total sales of gas by the Company for the year in question were 115,457,100 cubic feet. It follows that a reduction in the net price from $1 to 80 c. per 1000 cubic feet would reduce the annual net earnings of the Company by about $23,091·42, or to only $1314·03 if the quantity of gas sold remains constant. Making reasonable allowance for an increase of gas sales through lower prices, can it be thought that the net profits on gas at 80 c. in Haverhill will cover depreciation, and yield a fair return on property worth $500,000? In the past, the gas consumers at Haverhill have contributed a surplus that has been cashed for $425,000 by the stockholders of the Company. In the future, these consumers seem destined to pay a fair return on the surplus thus contributed.

The Chemistry of Coal and of Coal Mines.

At a Meeting of the Andersonian Chemical Society of the Glasgow and West of Scotland Technical College last Saturday week, Mr. Daniel Burns, M.Inst.C.E., read a paper on "The Chemistry of Coal and of Coal Mines." He gave an account of the methods adopted by chemists for extracting from coal ammoniacal liquor and oils, as well as the so-called coal-tar products. He detailed the gases occluded in coal, and showed how they were liberated. Free nitrogen as well as carbon dioxide occur in choke damp, and although both these gases exert a similar influence upon lamp flame, they have different physiological actions. He illustrated how the latter gas could be estimated, and said it should not exceed at most 2·5 per cent. of the air. Speaking of the explosiveness of fire damp (methane), the author showed that the explosion was greatest with a proportion of one part methane to fifteen parts of air. The presence of this gas also considerably increased the risk of explosion where coal dust was present in quantity. He pointed out the great danger incurred in mines where carbon monoxide is present, and showed that this gas is formed by the combustion of carbon in an insufficient supply of oxygen.

LONDON AND SOUTHERN DISTRICT JUNIOR GAS ASSOCIATION.

Notes on Materials for Concrete Tanks, &c.

A Meeting of the Association was held at the Regent Street Polytechnic last Friday, when a lengthy paper, contributed by Mr. R. H. Brown, on the subject of "Materials for Concrete Tanks, &c.," was read by the President (Mr. Walter Grafton). As is recorded in another column, Mr. Brown has gone to South Shields, and so has been compelled to resign the position of Vice-President of the Association.

The author prefaced his communication with the remark that, in view of the increasing use of concrete for gasholder and other water-tight tanks, as well as its general use for many other purposes, a few words on the constituents of concrete and their various actions and relations to each other in forming a sound conglomerate, might not be without interest. Concrete, he said, was usually composed of portland cement, sand, and some hard material which was designated the "aggregate." He then described the two methods of manufacturing portland cement, and said that for all important work the cement should be of good quality—of proper composition, free from all impurities, well burnt, finely ground, and well matured. It should have a specific gravity of not less than 3, and contain not more than 62 per cent. of lime, 1·75 per cent. of sulphuric acid, 1·25 per cent. of magnesia, 1 per cent. of carbonic acid, and from 1 to 1·5 per cent. of insoluble residue. The cost of testing all defective cement should be deducted from money due to the contractor; and all cement before use should be carefully tested by a qualified analytical chemist. Some authorities were against any gypsum or calcium sulphate being allowed in cement; but in these days of fine grinding, a medium was considered necessary by certain makers as an antidote to quick setting. It was easy, however, to overdo it; and it was believed that gypsum was very detrimental to cement subject to the action of sea or brackish water. The fine grinding of cement was resorted to, as it had been found to counteract "blowing" due to the presence of free or improperly combined lime, owing to overliming or underburning. Though at one time it was usual to specify a 76 sieve (5776 meshes per square inch) or even a 50 sieve (2500 meshes), 14,400 meshes per square inch were now quite common, and a sieve of 32,400 meshes was growing in favour. Unsound overlimed cements were generally slow-setting; but a slow-setting cement, if sound, was preferable to a quick-setting one. Finely-ground cements, on the other hand, were sometimes too quick-setting for proper use. As, therefore, it was essential to have a fine grinding, its quick setting must be overcome artificially. This could be done by thorough aeration, to allow the alluminate of lime to become thoroughly hydrated, and thus modify its activity; or (as already mentioned) by the addition of small percentages of gypsum in the course of manufacture. By extremely fine grinding, the cohesive power of the cement was decreased, but its adhesive qualities were greatly increased, thus enhancing its value.

On the subject of testing, Mr. Brown remarked that test blocks of neat cement should be made with 20 per cent. of water, and the mixture placed in a mould without ramming, and kept one day in a moist atmosphere at a temperature of not less than 40° Fahr. The blocks should bear a stress of 350 lbs. per square inch after seven days, 450 lbs. after fourteen days, and 580 lbs. after twenty-eight days. The neat cement test alone was useless, unless it was supplemented by a test made with standard sand, in the proportion of three parts of standard sand (from Leighton Buzzard) to one part of cement, in order to determine its constructive and cementitious value. Cement and sand blocks should bear a stress of 140 lbs. per square inch after seven days, 180 after fourteen days, and 220 lbs. after twenty-eight days. The blocks should rest on supports 6 inches apart, and the weight be applied by steady increments at the centre. Cakes made with 20 per cent. of water, and kept in the air until set, and afterwards immersed in water for twenty-four hours, should show no signs of cracking on the surface. All cement should show a uniform growth of strength—this was very important. A pat of cement 3 inches diameter and ½ inch thick should, after the expiration of seven days, adhere firmly to the natural surface of a Welsh slate; the slate to be soaked in water previous to the application of the cement, and to be kept moist during the interval. A sample of cement should be made into a paste, and put into a test-tube. If in setting it should shrink away from the sides or burst the tube, it was not ready for use.

The sand used for concrete should be of good quality—sharp and clean. In certain places great care was necessary in the selection of sand, as some sorts contained arsenic, gypsum, and other deleterious constituents. The ratio of angular grains should be greater than those which were water-worn; and the particles should not be in a too finely-divided state, in order to form a good key for the other coats of rendering and similar work. Sand containing clay or other earthy matter must be washed, as otherwise, when wetted, the clay would spread and surround the cement particles, and thus prevent their adhesion. Granite sands, containing mica, were also to be guarded against. Sea sand should be washed to eliminate the salt, which would otherwise retard the drying out of the work. Efflorescence would

also appear later, and be absorbed by the water of a gasholder tank; and the salts, if in sufficient quantity, would later on be detrimental to the ironwork.

The "aggregates" which went to make up the concrete should consist of the most suitable material to be obtained locally, and might be broken stone (granite, limestone, &c.), gravel, Thames ballast, burnt ballast, coke breeze, blast-furnace slag, broken brick (if well burnt), or other material. In the case of floors subjected to heat and water alternately, coke breeze was considered best by some people, while slag was also satisfactory. Thames ballast and stone were liable to split up and cause disintegration, under extremes of heat and cold. For gasholder tanks, if in clay or gravel soils, the excavated material, if clay, might be well burnt and broken and utilized, and, if gravel, it might be screened to eliminate the sand, which might afterwards be gauged in the usual manner with the other materials. The gravel, however, should not be used without screening, as it was difficult to ascertain the exact proportion of sand with which it was already mixed. For gasholder tanks, all aggregate should be of such size that it would pass a 1½-inch diameter ring, but should not be smaller than a hazel nut. For retaining walls, it might be somewhat larger—say, to pass through a 2-inch ring; but in no case should a greater size than would pass a 2½-inch ring be used.

The mixing could be done either by hand or by machinery. The former was better for small jobs; but where the work was of any magnitude, a good mechanical mixer should be employed. The Koppel steam-driven mixer was a good type to use. Another good machine (and one which had the approval of the Associated Cement Manufacturers) was that known as the "Gravity Mixer." The latter had been used recently in the construction of a large gasholder tank, and gave every satisfaction. It was automatic in its action, and required no power. Water-tight concrete must be limited in the proportion of two of sand to one of cement, as it was essential in making good concrete that all the interstices of the aggregate should be filled with mortar. The percentage of interstices was higher with broken stone than with shingle; and the matrix must, of course, be varied accordingly. The approximate percentage of interstices of any aggregate could be ascertained by filling a tank of known cubical content with aggregate, and then filling up the remaining space—*i.e.*, interstices—with water, noting the quantity used. The percentage of interstices could thus be calculated. If the aggregate was of absorbent material, it must, of course, be previously soaked in water.

Mr. Brown concluded his paper with some examples of how to obtain the ratios of cement, sand, and aggregate per 100 parts of finished concrete; and he also furnished several appendices showing analyses and tests of cements and sands made in connection with a large gasholder tank recently constructed. We reproduce one of the examples, and also the analyses of the cements.

Example.—If the ratios be given as 1 of cement, 2 of sand, and 4 of broken stone having 48 per cent. of interstices, to find how much cement, sand, and stone should be used in making 100 parts finished concrete—

If a = cement, $2a$ = sand, and $4a$ = aggregate.

Mortar $= \frac{(a + 2a)3}{4}$	$= 2{\cdot}25\,a$
Interstices $= 4a \times 0{\cdot}48$	$= 1{\cdot}92\,a$
Mortar in excess	$= 0{\cdot}33\,a$

Aggregate mortar in excess of interstices.

$4a + 0{\cdot}33\,a$	= 100 parts
4·33	= 100 ,,
a	= 23·09
$2a$	= 46·18
$4a$	= 92·36
	161·63

Analysis of Three Samples of Cement.

[A and B are South of England cements; C is a Belgian cement.]

	Per Cent. A		Per Cent. B		Per Cent. C
Silica (SiO_2)	21·52	..	20·78	..	24·70
Insoluble residue (clay and sand).	0·82	..	1·20	..	3·64
Alumina (Al_2O_3) . . . Ferric oxide (Fe_2O_3). .	10·68	..	11·38	..	6·62
Lime (CaO)	62·20 *	..	61·00 *	..	58·26 *
Magnesia (MgO)	1·02		1·05		1·81
Sulphuric anhydride (SO_3).	0·92	..	0·97	..	1·24
Carbonic anhydride (CO_2) Water (H_2O)	1·52	..	2·66	..	2·54
Potash (K_2O) Soda (Na_2O) Alkalies and loss .	1·32	..	0·96	..	1·19
	100·00	..	100·00	..	100·00
Specific gravity. . .	3·165	..	3·110	..	3·055
*Value after deduction for the necessary formation of calcium sulphate . .	61·56	..	60·32	..	57·39
Calculated as calcium sulphate	1·56	..	1·65	..	2·11

Remarks.—A. In a very fresh condition; at present not sound. Would improve if time were allowed for it to mature; composition normal. B. Satisfactory quality. C. Composed of unsuitable raw materials. Underburnt and of inferior quality. Note high percentage of insoluble residue + SO_3.—Rejected.

Unfortunately, there were scarcely any members present to hear Mr. Brown's paper read; and consequently but very few remarks were made upon it. It was, however, generally recognized that the paper was a valuable one, and that the copies which had been prepared by the Secretary (Mr. P. F. Scarth) would be very useful to the members for future reference. Mr. Carpenter said that, with regard to the aggregate, shingle was mentioned; and, of course, this was very largely used. He should, however, like to ask whether an aggregate consisting of pebbles, such as was employed in Dover Harbour for instance, was as tenacious as if (say) brick rubble was used. It seemed to him that the smooth surface of the pebble was not so good for the cement to get a grip of. It would have been interesting also if they had had some comparisons of concrete with brick tanks. He believed concrete tanks were considered to be cheaper than brick ones; and he would have been glad to have had this borne out by actual figures. Then, again, how did a concrete tank compare, in the matter of life, with a brick tank? Concrete tanks, he supposed, were puddled, and not rendered, on the inner surface; and, in this case, if the water in the tank became at all oily, would that have a bad effect on the concrete and reduce its life to any extent? There was another question on which he would like to get an answer from Mr. Brown. Assuming the ground to be selected for excavation, would he, if called upon to construct a gasholder tank, recommend a steel or a concrete one, and on what grounds would he base his recommendation?

The President remarked that the paper was entirely a practical one, and also a valuable one. Concrete tanks were more likely to be put down in future than brick tanks. Of course, bricks themselves were porous; and the difficulty with regard to the brick tank was the necessity for puddling—though he did not mean to say that concrete tanks would not require puddling. With regard to the so-called "Gravity" mixer, he thought it was a long way ahead of all others. There was no machinery to speak of required to mix the ingredients; and the mixing was almost perfect. He had seen such a machine in operation, and it worked splendidly. When concrete was watered, it should not be done with a hose or pail, but in fine streams. The analyses of cements A and B were particularly useful, coupled as they were with the foreign sample C. With regard to tests spread over a number of days, everything depended upon the fineness of the cement and the days allowed for maturing. The breaking or tensile strain of mortar when made up was only one of the methods of testing to see whether the cement was sufficiently strong. As Mr. Brown had mentioned, they might have a good cement, but owing to the fault of the aggregate a bad concrete resulted. So that, in addition to the cement, the other material in the concrete must be of good quality in order to obtain a satisfactory result. With regard to the Monier system of reinforced concrete, this furnished a material which was at least six or seven times stronger than concrete made in the usual way. Sometimes it was even stronger than that.

On the proposition of the President, the members passed a vote of thanks to Mr. Brown for his paper, and of regret that he had been forced to sever his connection with the Association.

MANCHESTER AND DISTRICT JUNIOR GAS ASSOCIATION.

A Meeting of this Association was held at the Manchester School of Technology last Saturday; and there was a fair attendance of members.

Mr. D. V. Hollingworth, F.C.S. (Salford), read a paper on

THE NATURE OF FLAME.

The author began by saying that, before proceeding with an inquiry into the nature of flame, it was highly desirable that the members should thoroughly understand the meaning of certain terms which it was necessary to use throughout the paper. Taking the term "combustion," he explained that, when two substances chemically unite with each other with so much energy as to give out light and heat, they were said to be undergoing the process of combustion, during which a certain temperature was attained and a certain amount of heat evolved. The amount of heat was always the same for the same reacting gases, so long as the products of combustion were the same; but the temperature attained was entirely dependent on the rate or vigour of the combustion. When both the substances taking part in the combustion were gases, the locality in which the chemical action took place was called a "flame." It was essential for the production of flame that both of the reacting substances should be gases. If one were a solid not volatile at the reaction temperature, no flame accompanied the combustion. He added that, as it was impossible, in the short time at his disposal, to discuss the nature of all kinds of flames, he would confine himself entirely to those with which the members were most familiar—viz., the luminous and non-luminous hydrocarbon flames produced when coal gas was burnt in an insufficient or an excessive supply of air. These two kinds of flame exhibited characteristics so widely different from each other, that they would be best dealt with separately, beginning with the non-luminous flame.

Mr. Hollingworth then proceeded as follows: All non-luminous

flames are produced in the bunsen burner, in which two important causes operate to produce the flame in its position on the top of the tube and to make it non-luminous: (1) When a jet of gas issues from a small orifice, there is a reduction of pressure in the immediate vicinity of the orifice; and (2) there should be a definite relation between the velocity at which the gases travel up the tube and the propagation of combustion in the mixture of air and coal gas. On the first cause depends the entrance of air through the air-holes; and upon the second, the continuance of the flame in position on the top of the tube. Any reduction in pressure round the jet causes the air to be pulled in; and this, intermingling with the gas as it passes up the tube, causes a more or less explosive mixture to be formed.

If the flame is to remain in position at the top of the tube, there must be a definite relation between the speed at which the explosive mixture travels and the rate at which combustion takes place. If combustion is being propagated throughout the flame at a greater rate than the mixture comes up the tube, the explosions occur without the assistance of the oxygen outside, the flame travels down the tube, and we observe what is known as "striking-back." The cause of this disagreeable phenomenon is that too much air is being admitted at the base of the tube, and the mixture passing up the tube is in consequence too explosive.

Now, how does it come about that the admission of air to the gas before combustion destroys the luminosity? This is due to the combined operation of many causes, among which are the following: Increased oxidation, due to the better mixture with oxygen, the dilution of the gas with inert nitrogen of the air, and the cooling of the flame by both nitrogen and oxygen. Formerly it was thought that the admixture of air with the gas before combustion—bringing about a more rapid and complete oxidation of the hydrocarbons—was alone responsible for the destruction of the luminosity. This idea has been greatly modified, because inert gases such as nitrogen, carbon dioxide, steam, &c., which cannot exert any oxidizing action, will bring about just the same destruction of luminosity.

How is this brought about? Let us take first the action of the oxygen admitted to the burner. It would seem that the activity of oxygen in burning up the molecules of hydrocarbons before they became decomposed, was responsible for some of the luminosity, and that the cooling and diluting action of the same gas also helped in this result. The nitrogen introduced increases the temperature necessary to effect decomposition of the hydrocarbons, and thus prevents the occurrence of those secondary thermal changes upon which the luminosity of a flame depends. These changes, brought about by the heat evolved during the combustion of the hydrogen and the methane, according to Professor Lewes, consist in the decomposition of the ethylene, benzene, &c., and result in the decomposition of this gas to carbon and hydrogen. Much less oxygen is required to destroy the luminosity of a coal-gas flame than of other gases, because the latter act only by preventing the attainment of a very high temperature, whereas oxygen acts as a cooling and a diluting agent and as an oxidizer. Air containing an added quantity of oxygen destroys the light from a flame more completely than normal air does; and air containing less oxygen than normal destroys the light less completely. Even in an ordinary luminous flame, the outer mantle of all is quite non-luminous, partly because there is in that region an excess of oxygen (air), some of which is dragged into the flame, and exerts its cooling influence upon it. So it is with the bunsen flame. The air passing up the tube greatly cools the flame gases at the point where they would otherwise be decomposing to other hydrocarbons of greater light-giving power.

The higher the specific heat of the diluent gas—that is to say, the greater its power to abstract heat from the flame—the less of it is required to destroy the luminosity of that flame. For example, it takes less carbon dioxide than nitrogen to destroy the light of a flame, because the absorption power for heat of carbon dioxide is much greater than is that of nitrogen. The specific heat of oxygen again is less than that of nitrogen; but the cooling effect of the former is greatly overpowered by the increase in temperature due to oxidation. As a result of the combined action of oxidation, dilution, and cooling through the admission of air to coal gas prior to its combustion, the flame is not so hot in parts as the corresponding parts in a luminous flame; but at other parts it is hotter than any part to be found in such a flame. In short, it would appear that, size for size, the bunsen flame attains a higher temperature generally than does the luminous flame. When the same amount of gas is in course of combustion, the former gives a much shorter flame. It seems as if the higher temperature attained at a point half way between the tips of the inner and the outer cones was due to a sort of concentration of time and locality of reaction.

We may now pass on to the luminous flame. In this case, as in the last, let us confine ourselves to remarks on the luminosity of hydrocarbon flames, and take as our example the diluted hydrocarbon coal gas burning without previous admixture with air. It is important to remember that the light-giving properties of a coal-gas flame are not due to the operation of any one cause. There are many influences which, acting together, tend to modify such a flame. For instance, we have the effect of temperature, of the density of the vapours, of the introduction of solid matter into the flame, and also the humidity of the gas and atmosphere. Then, again, we have the effect of the kind of burner and of the chimney we put upon it, and of the rate at which the gas issues. Lastly, we have the effect of the composition of the gas itself. We will now take the most important of these influences, and satisfy ourselves as to their individual potency. We will consider the effect of temperature upon flames under three different conditions: (1) Where solid matter is known to be absent; (2) where it is known to be present; and (3) where it is believed to be present.

The effect of temperature in the first case is very marked; it having been repeatedly shown that when the temperature of combustion is raised, a great increase in the light evolved is obtained. For example, carbon disulphide burning in air gives but little light. When, however, it is burned in oxygen, the temperature of combustion is greatly raised, and a brilliant light is obtained. In the second case, the same marked increase in luminosity follows a rise of temperature. This may be illustrated very well by using a common incandescent burner and mantle. We all know what a good light is obtained when ordinary air is used to feed the burner; but if pure oxygen is used instead of air, the luminosity is augmented enormously. The rate or vigour of the combustion has been increased, thus producing a higher temperature; and the mantle—the solid—is raised to a higher degree of incandescence. Coming to the third effect of temperature, in such a category is placed the flame from coal gas. When such a flame has its temperature raised, its luminosity is also increased. This is taken advantage of in the case of regenerative burners. When the gas itself and the air supplying the flame are heated, greater light is obtained; and, conversely, if the two are cooled, there is much less light. This again proves that at high temperatures the two gases react more vigorously than they do at low ones.

Let us now pass on to a consideration of the influence of density on the flame. This was first studied by Professor Frankland about the year 1860. He said that dense gases and vapours become luminous at much lower temperatures than the same gases in a more rarefied condition; and he demonstrated that non-luminous flames might be rendered luminous by increasing the pressure. He further held the view that luminosity is not caused altogether by the presence of heavy hydrocarbon vapours. That the luminous characters of a flame are intimately associated with the pressure to which the flame is subjected is clearly shown by the fact that at high altitudes or in an artificially rarefied atmosphere flames have their luminosity greatly decreased, and, *per contra*, flames in deep places or in vessels under increased pressure become more luminous. However, here again complications arise; for by altering the pressure of the flame, the temperature is also altered. If the pressure is lessened, the temperature falls; and though there may be less loss of heat by radiation in a rarefied atmosphere, it is likely that the lowering of the flame temperature may modify the chemical decompositions taking place within the flame.

If a piece of almost any refractory solid be inserted into the hot part of a non-luminous flame, the high temperature present causes the solid to glow and to emit light; but the composition of the solid remains entirely unchanged. A very familiar instance of this is furnished by the incandescent gas systems that are now so popular. In this case the extra light is due to the introduction into a non-luminous flame of a refractory solid—the mantle—which becomes sufficiently hot to glow, or, as it is termed, to become incandescent.

Having dealt with the composition of the mantle, and the action of its constituent elements in the production of light, Mr. Hollingworth said he had dealt at some length with the influence of increased temperature and density of flame gases in producing an increase of light, and had referred to the effect of solids in coal-gas flame, for the reason that we were told that the luminosity of a flame is due to the incandescence of solid particles of carbon and the heavy hydrocarbons in the gas. "Whence," he asked, "came these particles of carbon and heavy vapour?" and he proceeded to answer his question by examining the theories advanced on the subject. On this point he said: It was Faraday and Davy who first suggested that in a hydrocarbon flame there was a sort of preferential combination of the hydrogen of the unsaturated hydrocarbons with the limited amount of oxygen available in the yellow portion of the flame; thus causing a separation of carbon and denser hydrocarbon vapour—the latter containing a smaller percentage of hydrogen than original hydrocarbons. John Dalton, on the other hand, insisted that there was a preference of oxygen for the carbon; and Professor Smithells has recently said that there is a distinct preferential combination between the carbon and oxygen; causing a separation of hydrogen. He lays special stress upon the fact that the carbon of the hydrocarbons burns to carbon monoxide, and sets free hydrogen. This appears to be confirmed by the experimental results, which show that at positions high up in the flame a greater proportion of carbon monoxide is to be found He thinks the separated carbon undoubtedly present owes its existence to dissociation by heat of the hydrocarbons, and he distinctly says that the view usually held, that the luminosity is due to separation of carbon particles in consequence of the readier combustibility of hydrogen, is erroneous. Professor Lewes has evolved a very interesting theory to account for the luminosity of flame, which is supported by a great amount of practical result. He says that where coal gas burns freely in air, it gives three distinct zones of flame—viz., an inner, a luminous, and an extreme outer zone. In the inner zone the temperature rises from a low point at the mouth of the jet to 1000° C. at the apex of the zone. There the hydrocarbons undergo decomposition; resulting in the formation of acetylene and carbon monoxide. On

reaching the luminous zone, where the temperature ranges from 1000° to 1200° C., the acetylene is broken up by the heat, with liberation of carbon, which at the moment of production is heated to incandescence by the combustion of the carbon monoxide and hydrogen, and by its own combustion; thus giving luminosity to the flame. Then in the outer sheath, where combustion is nearly completed, the cooling and diluting influence of the entering air renders a thin layer non-luminous, and finally extinguishes it altogether. Professor Lewes says that both hydrogen and carbon monoxide, methane, and acetylene escape here. Shortly put, his theory is that acetylene is produced from the hydrocarbons in the cooler portions of the flame; that the acetylene is decomposed in the hotter parts, and decomposing yields carbon, which heated to incandescence radiates heat and light. This nearly approaches the view of Professor Smithells.

The members would, he thought, remember that Faraday and Davy agreed that there was a preferential combination between hydrogen and oxygen, liberating carbon; whereas Dalton and Smithells argued that the preferential combination was between the carbon and oxygen, liberating hydrogen. Professor Lewes suggests that the hydrocarbons are regularly decomposed in stages —acetylene being the chief middle product, and carbon and hydrogen following; the latter burning to carbon monoxide, carbon dioxide, and steam. Professor Bone and his pupils have recently shown, however, that when hydrocarbons undergo combustion in an insufficient supply of oxygen to burn them completely to carbon dioxide and steam, there is absolutely no preferential combination either between the carbon and oxygen or the hydrogen and oxygen. They say that the combustion of a hydrocarbon is essentially a process of hydroxylation. The oxygen initially enters the hydrocarbon, and is distributed between the hydrogen and oxygen, giving rise to unstable hydroxylated molecules, which undergo thermal decompositions into simpler products. When carbon or oxygen is separated, it is the result of the secondary thermal changes.

Mr. Hollingworth concluded by saying: Shortly put, the result of these researches shows that: (1) There is no preferential combination of either carbon or hydrogen when ethylene burns in a limited supply of air; (2) that formaldehyde is a prominent middle oxidation product, and that at a low temperature its formation is preceded by that of less oxygenated products; (3) formation of aldehydes precedes that of steam; and (4) formation of secondary products is entirely ruled by the temperature conditions—that is to say, at low temperature we get (oxygen in excess) carbonic oxide and water, and at high temperature (oxygen limited) carbon monoxide and hydrogen. There is no separation of carbon or liberation of acetylene at any temperature except when the oxygen present is insufficient even to burn the ethylene to formaldehyde. In such cases, the excess of ethylene is simply thermally decomposed; giving carbon, hydrogen, methane, and acetylene. We are told that what is true of ethylene is also true of methane, ethane, and other hydrocarbons present in coal gas. Professor Bone's and his assistants' theories have been substantiated by the fact that during their experiments they obtained both formaldehyde and acetylene. The following represents what they think takes place during the combustion of a hydro-carbon:—

In the case of methane—

(1) $CH_4 + O = CH_3{\cdot}OH.$

The methol alcohol, by a further introduction of an oxygen molecule, goes to methylene alcohol as—

(2) $CH_3{\cdot}OH + O = CH_2(OH)_2$

Methylene alcohol is unknown in the free state; it breaks up—

(3) $CH_2(OH)_2$ giving $H{\cdot}CHO$ (Formaldehyde.) and H_2O (Steam.)

The formaldehyde itself also breaks up to the simplest products. In the case of ethane, we have

$$C_2H_6 + O = \underset{\text{Ethyl alcohol}}{CH_3{\cdot}CH_2{\cdot}OH}$$

$$CH_3{\cdot}CH_2{\cdot}OH + O = \underset{\text{Dihydroxyethylene}}{CH_3{\cdot}CH(OH)_2}$$

$$CH_3{\cdot}CH(OH)_2 = \underset{\text{Acetaldehyde}}{CH_3{\cdot}CHO} + H_2O$$

Such reactions as these lead solely to the production of $CO{\cdot}CO_2H_2O$ by the splitting up of the oxygenated compounds, and do not lead to the production of carbon.

In the case of ethylene, the main course of the reactions is—

$$\underset{\text{Ethylene}}{H{\cdot}C{\cdot}H \parallel H{\cdot}C{\cdot}H} \xrightarrow{+O} \underset{\text{Hydroxyethylene}}{H{\cdot}C{\cdot}OH \parallel H{\cdot}C{\cdot}H}$$

$$\underset{\text{Dihydroxyethylene}}{H{\cdot}C{\cdot}OH \parallel H{\cdot}C{\cdot}H} \xrightarrow{+O} \underbrace{\underset{\text{Formaldehyde}}{H{\cdot}C{\cdot}OH}}_{CO_2 + H_2} \rightarrow \underbrace{H{\cdot}C{\cdot}OH}_{CO + H_2O}$$

$$\left.\begin{matrix} HO \\ | \\ O{\cdot}C{\cdot}OH \end{matrix}\right\} CO_2 + H_2O \text{ carbonic acid.}$$

Mr. F. S. Sinnatt, F.C.S., read the following paper on

THE ESTIMATION OF NAPHTHALENE BY MEANS OF TITANOUS CHLORIDE.

The use of titanous chloride as an analytical reagent for the determination of various compounds was first suggested and elaborated by Professor E. Knecht, Ph. D., F.I.C., who also applied it to the exact estimation of picric acid. The method has now been turned to account by the author for the indirect estimation of naphthalene in coal gas. He titrates the picrate, separated in the usual way from a known volume of the gas; thus ensuring rapid working. Test analyses made on pure naphthalene picrate were found to give theoretical results. The method is carried out as follows.

Storage and Standardization of the Titanous Chloride Solution.—Of commercial titanous chloride 50 c.c. are first boiled for a few minutes with an equal volume of concentrated hydrochloric acid, and then made up to 2 litres. The solution is stored in the apparatus shown in "Sutton's Volumetric Analysis" (p. 224). The burette is kept under a slight pressure of hydrogen. To standardize the solution, use is made of the following reaction, which Professor Knecht has shown takes place quantitatively in the cold:—

$$TiCl_2 + FeCl_3 = TiCl_3 + FeCl_2.$$

The indicator used is potassium sulphocyanide. A standard solution of iron alum is kept in a burette ready for use.

Estimation of Naphthalene.—Naphthalene picrate is separated by any of the usual processes in about 20 c.c. of alcohol, and 20 c.c. of concentrated hydrochloric acid added. The solution is boiled, an excess of the standard titanous chloride added, and the whole boiled again and then cooled. This part of the process is carried out in an atmosphere of carbon dioxide. Potassium sulphocyanide is added, and a standard iron alum solution run in until the blood-red coloration is obtained. From the resulting figures, the volume of titanous chloride corresponding to the picric acid present in the naphthalene picrate is obtained. The amount of naphthalene present may be calculated from the value of the titanous chloride used in iron. The following is an example of the calculation: 1 gramme of iron = 0·12698 (0·127) gramme of naphthalene. 50 c.c. of titanous chloride are used. Strength of the titanous chloride, 1 c.c. = 0·001784. After boiling and cooling, the volume of iron alum solution required to produce the red coloration = 30 c.c. The volume of titanous chloride required for the picrate = (50 − 30) = 20. In iron this = 20 × 0·001784 = 0·03568 gramme of iron. Since 1 gramme of iron = 0·127 gramme of naphthalene, 0·03568 gramme of iron = 0·00453 gramme of naphthalene present in the gas passed.

The work is being continued, and comparative estimation will be given later.

The papers gave rise to very little discussion.

Mr. Thorp, in proposing a vote of thanks to the authors, said he was glad that they had had the papers, as it would raise their Junior Association in the estimation of the Senior Societies. He had listened to many lectures, but he did not think he had heard one where the lecturer had a better grasp of the subject.

Mr. Ginman seconded the motion, and it was carried unanimously.

The Hon. Secretary (Mr. A. L. Holton) announced that the next meeting would be held on the 17th prox., when a visit would be paid to one of the gas-works at Oldham, and that the annual dinner would be held on the 3rd of March.

SCOTTISH JUNIOR GAS ASSOCIATION.

Visit to the Renfrew Corporation Gas-Works.

On the afternoon of Saturday last, the members of the Scottish Junior Gas Association—Western District—paid a visit to the Corporation Gas-Works at Renfrew. The members assembled at the works at three o'clock. They were received by Bailie Ferguson, the Convener of the Gas Committee; Mr. J. M'Laren, the Burgh Chamberlain; and Mr. T. Lighbody, the Gas Manager. Proceeding at once to the works, the visitors ascended the hydraulic hoist to the stage level, and made a good survey of the arrangements for taking in, breaking, storing, and otherwise handling coal, and the method of handling coke. The plant was described in the paper on "Handling Material" read by Mr. J. W. M'Lusky at the meeting of the Association in Glasgow the previous Saturday (*ante*, p. 227); and it will be sufficient to say of it that the visitors were greatly struck by the simplicity of the arrangements, and their completeness and adaptability to a works of the size of those at Renfrew. Continuing their walk, at our was made of the lime-store, the testing-room, and the men's room; after which the retort-bench and the coke-quenching appliances were inspected, and, finally, the outside plant and the purifier-house. The works are exceedingly compact and very well arranged, and have been constructed with a view to anticipated extensions; the town being a highly progressive one.

The company were afterwards entertained at a meat tea in the Town Hall; about ninety sitting down.

Provost Cunningham, who presided, on behalf of himself and his colleagues at the Council Board, extended to the visitors a

very hearty welcome to the ancient Royal Burgh. Their gas-works dated back to the year 1842; and in that position they stood a little different, he understood, from nearly all other towns, in that the gas-works had been erected and carried on by the Corporation, instead of by a company. They were aware that in other towns the gas-works had been mostly promoted and carried on by companies, and were afterwards taken over by the corporation at enormous cost. They had lately renewed their gas-works, under the superintendence and management of their able and respected Manager—Mr. Lighbody. He might likewise tell them that the Corporation of Renfrew were keeping pace with the progress of the times, for only last year they had applied for parliamentary powers to enable them to light the burgh with electric light and for other purposes. He trusted the members would be pleased with their visit to the works, and that they would derive some benefit from it.

Mr. J. BELL (Airdrie), the President, said it gave him great pleasure to be present that day, and to see so many of their members turning out on such an occasion. They had had really a splendid exhibition. The visit, he was sure, had been enjoyed by everyone. They had seen works which did credit to the Engineer, and which did credit also to the town of Renfrew; and he had very much pleasure in calling upon them to accord a vote of thanks to the Convener and the members of the Town Council for their kindness and hospitality.

Mr. J. MACLEOD (Glasgow), the Vice-President, was sure they were very greatly indebted indeed to the Town Council for their kindness in giving them permission to visit the works. He had pleasure in supporting the proposal that they accord a hearty vote of thanks to the Town Council.

Bailie FERGUSON joined with the Provost in welcoming a junior body of engineers who had come to visit their works. They had the idea that their works had been built at the least possible cost, and to give them the efficiency which they desired.

Mr. J. LOWE (Glasgow) referred to the fact that 4½ millions of money was proposed to be applied to gas purposes, which showed that the gas industry was certainly not in a decaying condition. The object nowadays was to get a cheap supply of gas. The old days of gas-works monopoly were now past. They had to meet competition in various ways—with suction producers and electric generating stations, on a large scale—but he did not think there was the least occasion for them of the gas profession being down-hearted. Cheapness, of course, must be striven for; and from what they had seen in the Renfrew Gas-Works, he felt quite convinced that it would not be the fault of Mr. Lighbody and his assistants if the Renfrew Town Council were unable to give a reduction in the price of gas in the near future. They must also endeavour to cheapen the production of gas as much as possible; and possibly in the near future there might be some still further developments in the manufacture of cheap gas. From what they could gather from the Technical Journals, the whole industry seemed to be looking forward to some mode of carbonizing coal whereby a reduction in price would be made possible.

A social hour was spent, and then the party separated.

AMERICAN COMMERCIAL GAS ASSOCIATION.

Programme of the First Annual Meeting.

It may be remembered that some months ago an Association was formed in America, with the title of the National Commercial Gas Association, with the view of advancing the interests of the gas industry in that country; and the subject was dealt with in the "JOURNAL" for the 17th of October, in connection with a newspaper controversy to which the new venture, which was initiated by Mr. L. S. Bigelow, of New York (the Editor of "Light"), gave rise. The objects of the Association, as set forth in the Directors' circular, are :—

1.—The promotion of increased sales of gas, the promulgation of ways and means and methods necessary thereto, and the encouragement of manufacturers to produce high-grade and highly efficient devices that require gas for light, heat, and power.

2.—The establishment and maintenance of a spirit of fraternity between the members of this Association, by friendly exchange of information and ideas on the before-mentioned subject-matters, and by social intercourse.

3.—The inducement and extension of more cordial and friendly relations between consumers and producers of gas, based upon mutuality of interest.

4.—A substantial recognition of the value of the gas appliance manufacturer to gas interests, and his importance to the commercial end of the gas industry, as well as the encouragement of fraternal intercourse between the sales division of the gas industry and the appliance manufacturers, also between the commercial interests of the gas companies and merchants who make one of their special features the sale of devices for producing light, heat, and power, wherein gas is the element required.

All officers or employees of gas companies, as well as anyone qualified to assist in promoting the objects of the Association, were eligible for membership. The first President is Mr. W. J. Clark, of New York; the three Vice-Presidents being Messrs. C. E. Learned, F. W. Freuauff, and J. D. Shattuck, and the Secretary, Mr. Bigelow. In the circular referred to, it is pointed out that the Association do not wish or intend to conflict in any way with the working of the other Gas Associations, but rather that it should be instrumental in promoting and assisting in their undertakings.

It will be seen, from the second of the objects of the Association quoted above, that the establishment and maintenance of a spirit of fraternity between the members, by a friendly interchange of information and ideas, was contemplated by the founders. This it was thought could be best ensured by arranging the times and places of meeting so as to make it most convenient to work with the co-operation and hearty support of the existing Associations and the proposed Gas Institute, with the view of organizing a joint gathering, in which the members of the various Associations could take an active part, and which would afford an opportunity for having an exhibition of the best gas appliances, so that their merits might be seen and discussed. It was accordingly decided to hold the first annual meeting on Wednesday and Thursday last, in the Hotel Cadillac, New York; and from the programme which the Secretary has forwarded to us, it promised to be full of interest. There was, of course, to be an address by the President, and no fewer than nine subjects were to be discussed. Mr. J. D. Shattuck, the General Manager of the Suburban Gas Company of Chester (Pa.), was to ask the members to express their views on the best methods of doing business; Mr. R. M. Searle, the Engineer of the Westchester Lighting Company, of New York, was to deal with "The Relations of the Gas Man and the Gas Appliance Man to the Gas Industry;" and Mr. A. R. Burr, the Sales Agent of the New Haven (Conn.) Gas Company, with "Gas Company Appliance Business." Mr. Victor H. Rettich, the Engineer of the Knickerbocker Light and Heat Company of New York, had undertaken to give a *résumé* of incandescent gas lighting, and to show what it has done for the gas industry. There were to be two papers and two "talks" on gas-stoves: "The Gas-Range in the Kitchen," by Dr. A. H. Elliott, F.C.S.; "The Gas-Stove as a Promoter of Gas Sales from the Manufacturer's View-Point," by Mr. O. E. Moon; "Standardizing Gas Ranges," by Mr. R. H. Thomas; and "The Importance of Industrial Heating Appliances," by Mr. E. P. Reichhelm. The final paper in the list is on the subject of "The Co-operation of the Gas Company and Its Employees," the author being Mr. H. L. Barnes, the Manager of the Appliance Department of the Hartford (Conn.) City Gas Company. The Association are to be congratulated on the excellent programme prepared for their first meeting. The reading and discussion of the various subjects should be productive of much good.

FUTURE OF PRODUCER GAS.

In the course of a lecture last Thursday at the Blenheim Club, St. James's Square, Mr. J. H. Knight spoke at length upon the subject of producer gas as a motive power. The calorific power of producer gas, he said, was low. Its analysis showed it to consist of more than 50 per cent. of nitrogen, while carbonic oxide accounted for 20 per cent. In coal gas the inert gases did not exceed some 5 to 7 per cent. Nevertheless, he estimated that the saving of fuel with a producer-gas engine, as compared with a high-class steam-engine might be considered as one-third, and compared with the cheaper steam-engine more commonly used as one-half. One of the most interesting applications of producer gas was to marine work, and a producer-gas driven boat was entered in the reliability trials of the Motor Boat Club at Southampton last August. He believed that the producer-gas engine could also be used for locomotive and motor purposes. The railway companies spent enormous sums on fuel; an express locomotive with a heavy train burning about 40 lbs. per mile. He thought, however, that the greatest economy would be effected in the saving of repairs to boilers. For motor-car work—especially for lorries and omnibuses, in view of the fact that the price of petrol and even of heavy oil must advance with the demand—producer gas would be found useful. A producer for motor-car work had lately been patented.

In conclusion, Mr. Knight sketched his idea of what the marine engine of the future would be like. It would consist, he imagined, of a considerable number of cylinders, placed as a V on each shaft. Each cylinder would be so arranged as to be thrown out of work by closing a stop-valve, so that valves or sparking plugs could be changed or cleaned while the engine was running. There would be two sets of cams for operating the valves—one for moving forward, the other for reversing; these being driven by lugs. The producer would be in a well formed by bulkheads, moving right up from the bilge to 6 or 8 feet above the deck. Should an explosion of gas take place, it would blow right up this well, and would not in any way damage the ship.

Erratum.—In the report of the meeting of the Scottish Junior Gas Association—Western District—in last week's "JOURNAL," Mr. J. W. M'Lusky was made, by a mistaken reading of the reporter's notes, to say that "in the new works they had reduced the total costs ⅛d. per ton of coal." The figure should have been 1s. 6d.—one shilling and sixpence—per ton of coal and coke handled.

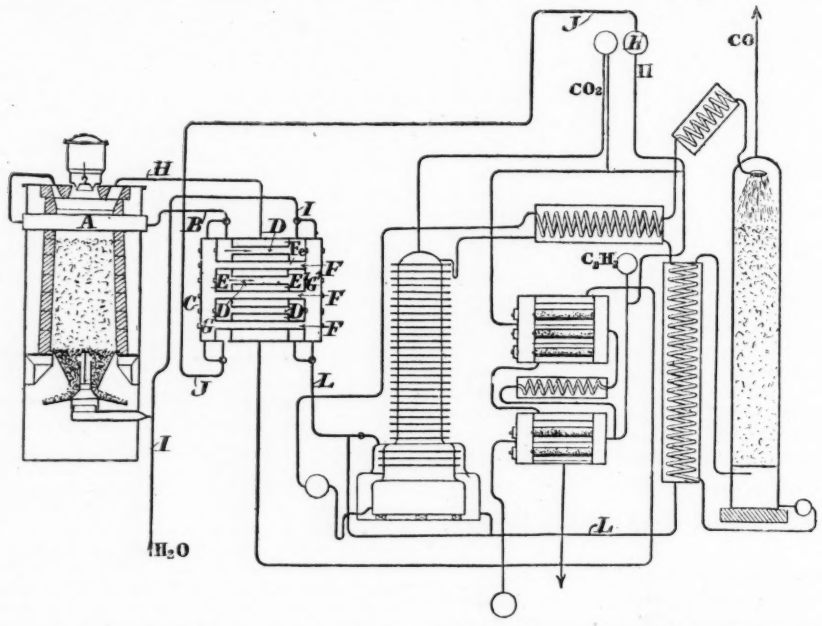
SABATIER'S HIGH-POWER GAS PROCESS.

In the "JOURNAL" for the 26th ult. (p. 896), a few particulars were given of the process patented in France by M. Paul Sabatier for the preparation of methane. The patent, which was dated Oct. 28, 1905, has been followed by two others, the text of the specifications for which appear in the current number of "Le Gaz." The date of publication of the first is Nov. 14, of the second Nov. 30; the former patent being for "a process for manufacturing a gaseous mixture containing hydrogen and methane," the latter for "a process for manufacturing lighting gas having a very high calorific power." The text of this specification is rather long, as M. Sabatier explains the whole of the reactions connected with his process. He, however, gives an illustrated description of the apparatus by means of which the reactions are produced on a commercial scale; and from this we take the following details.

Referring to the accompanying diagram, water gas is conveyed through copper turnings placed in the generator A, and maintained at a temperature of 500° to 600° C., both by the water gas itself and also by the gaseous products of ignition, so as to remove the sulphurous impurities contained in the gas. Steam, preferably superheated, is injected into the incandescent contents of the generator. The water gas is conveyed through the pipe B into the reaction apparatus C, which consists of a double set of pipes. Pipes D, in any required number, terminate in two collecting chambers EE^1. The pipes F, which are parallel to the others and the same in number, terminate in the collecting chambers GG^1. The oxide of iron is placed in the pipes D, and iron reduced from its oxide in the pipes F. The reaction apparatus is placed in a furnace in which some of the products of combustion from the generator are burnt, or other fuel gases obtained from outside. These gases re-enter the furnace, and the products of combustion make their exit by the pipe H. Chambers E and G are connected by two pipes terminating in a three-way cock on the pipe B; the chambers E^1 and G^1 by pipes to a three-way cock communicating with the pipe I conveying the superheated steam. The chambers E and G are connected by pipes with a three-way cock placed on the pipe J terminating in the vessel K containing hydrogen. Finally, the chambers E^1 and G^1 communicate by pipes with a three-way cock on the pipe L.

At the commencement of operations, the water gas, arriving by the pipe B, passes into the reaction apparatus and into the chamber E. It then travels through the pipes D, which contain oxide of iron at a temperature of about 1000° C. The water gas is thus transformed into a mixture of carbon monoxide and carbon dioxide, which issues from the chamber E^1 by the pipe L. At the same time, superheated steam is conveyed by the pipe I through the pipes F, containing reduced iron oxide at a temperature of 1000° C., into the chamber G^1. Pure hydrogen is formed, which enters the chamber G through the pipe J, and thence reaches the hydrogen vessel K. In consequence of the reactions produced in the pipes D and F, the iron oxide is gradually reduced under the action of the water gas, while the iron is being oxidized under the action of the steam.

After working a certain time, the operation is reversed, by turning the three-way cocks controlling the admission of the water gas, the exit of the carbon monoxide, the admission of the steam, and the exit of hydrogen; and the apparatus then works as follows:



Water gas, arriving by the pipe B, enters the chamber G, passes along the pipes F, which now contain iron oxide, in the opposite direction to that of the steam in the previous operation. The carbon monoxide and carbonic acid formed in these pipes enter the chamber G^1, whence they escape by the pipe L. At the same time steam enters by the pipe I into the chamber E^1, and passes along the pipes D in the opposite direction to that of the water gas before. At this point, the pipes D contain reduced iron; the steam is transformed into hydrogen, which enters the chamber E, passing thence to the hydrogen vessel through the pipe J. All the collecting chambers are arranged to allow the condensation of the steam, and the elimination of that produced in the reactions described.

The patentee claims a process to obtain directly from water gas and steam either a lighting gas of very high heating power, formed of a mixture of methane and hydrogen, or a gas having both high heating and lighting power composed of a mixture of methane, hydrogen, and ethylenic and formenic carbides, by the employment of a small quantity of acetylene. The process consists essentially in simultaneously transforming the water gas mixed with carbon monoxide and carbonic acid, by passing it, at a temperature of about 1000° C., over iron oxide, and of steam transformed into hydrogen by passing over reduced iron at the same temperature; the hydrogen being directly collected, and the carbonic acid and the carbon monoxide being separated one from the other. The pure hydrogen and pure carbonic acid thus obtained, suitably mixed, are then conveyed over reduced iron, nickel, or cobalt, or else a mixture of these metals, and heated to transform the gaseous mixture into methane, which is mixed in any suitable proportions with hydrogen, and utilized as a gas of very high heating power. Alternatively, the mixture of methane and hydrogen is subsequently added to purified acetylene, and all finally passed over reduced iron, nickel, cobalt, copper, or a mixture of these metals, heated to such a temperature that only the acetylene combined with part of the hydrogen undergoes a reaction, transforming it into ethylenic and formenic carbides for a gas having very high lighting and heating power.

M. Sabatier also claims for the practical realization of the process, a reaction apparatus to simultaneously transform water gas into a mixture of carbon monoxide and carbonic acid on the one hand, and steam into hydrogen on the other, consisting essentially of two sets of parallel pipes ending in separate collecting-boxes; all being placed in a furnace that can be raised to a temperature of about 1000° C. One set of pipes contains iron reduced from its oxide, and the other oxide of iron. The first is filled with steam to produce hydrogen, and the other set with water gas to form a mixture of carbon monoxide and carbonic acid. The flow of the gases being reversed, transformation of the iron into oxide takes place, and the water gas flows through the pipes in the opposite direction to that of the steam.

Further claims are for a distilling column receiving at the top a solution of bicarbonate of soda or potash, heated by part of the gaseous mixture leaving the reaction apparatus at a high temperature; the soda or potash being dissociated at this temperature to give off carbonic acid, which flows to the collecting gasholder, and carbonate of soda or potash, which goes to a scrubber. Into this scrubber the soda or potash falls at the top from the distilling column after cooling, and the gaseous mixture enters at the lower part from the reaction apparatus. The carbon monoxide passes out at the top; and the carbonic acid forms, with the alkaline bicarbonate, a bicarbonate of soda or potash, which, after reheating, passes to the distilling column.

M. Sabatier also claims for reaction appliances containing reduced iron, cobalt, nickel, copper, or mixtures of these metals

over which either a mixture of carbonic acid or hydrogen is passed to transform these gases into methane, or a mixture of methane, hydrogen, and acetylene, to produce a gas containing methane, hydrogen, ethylenic, and formenic carbides. These appliances consist essentially in a set of tubes united at their ends by collecting-boxes, and fixed in a closed receptacle through which a hot fluid can flow—the tubes being furnished with drawers containing catalyzing metals.

INCOMPLETE COMBUSTION OF GASES.

A dissertation by Dr. Wilhelm Misteli upon the above subject was printed in a recent issue of the "Journal für Gasbeleuchtung," whence we have derived the following particulars of the author's work and conclusions. The paper also contains some observations upon different methods of analytically separating hydrogen from hydrocarbons of the paraffin series, and upon the estimation of benzol vapour in coal gas.

S. Tanatar has shown that the presence of 11 or 12 per cent. of propylene in "detonating gas,"—*i.e.*, a mixture of hydrogen and oxygen in equivalent proportions—renders the detonating gas non-inflammable, and that the same result is brought about by the presence of 22 or 24 per cent. of methane. Hence it appears that the reaction—

$$C_3H_6 + 3O_2 = 3CO + 3H_2O$$

may proceed in preference to—

$$6H_2 + 3O_2 = 6H_2O$$

though the latter develops more heat. Similarly, the present author finds that an explosion can only be determined in a mixture of ethylene and detonating gas when the proportion of the latter reaches a certain figure. The ethylene dissociates into its elements, traces of methane and acetylene being formed; but acetylene is not produced as an intermediate stage in the decomposition of the ethylene. The oxygen of the detonating gas combines preferentially with the carbon of the hydrocarbon; and if, in the form of detonating gas, only so much oxygen is mixed with the ethylene as is sufficient to convert the carbon into monoxide, none but traces of hydrogen are oxidized. When somewhat more oxygen is introduced, part of the hydrogen burns; but there is no increase in the amount of carbon dioxide formed. Per volume of ethylene, the critical quantities of oxygen necessary to give yields consisting of (1) carbon monoxide and hydrogen only, (2) carbon monoxide and water vapour, and (3) carbon dioxide and water vapour, are 1 volume, 2 volumes, 3 volumes respectively; these being equivalent to 3, 6, and 9 volumes of detonating gas.

The detonating gas only explodes when enough oxygen is available; about 33 parts of ethylene by volume inhibit the explosion of 100 parts of detonating gas. When various mixtures of detonating gas and ethylene are exploded, as the amount of ethylene that is originally present decreases, the amount of carbon dioxide in the products increases slowly, the unsaturated hydrocarbons (ethylene and traces of acetylene) disappear, small quantities of oxygen begin to escape combination, the methane rapidly vanishes, and the carbon monoxide increases at first but afterwards falls in favour of dioxide. The hydrogen of the detonating gas is untouched; and therefore the amount of hydrogen among the products is equal to the total present in the exploding mixture. [The figures given by the author cover mixtures containing down to 15·73 parts of ethylene in 100 of detonating gas.]

Broadly speaking, the phenomena of the incomplete combustion of propylene, acetylene, and methane are the same as those described for ethylene. In the case of propylene, analogy indicates that it should explode when mixed with 1·5 volumes of oxygen—that is to say, with 4·5 volumes of detonating gas. Actually, however, explosion does not occur until the proportion reaches 2 volumes. Hence about 18 parts by volume of propylene destroy the inflammability of 100 parts of detonating gas. This figure is different from that recorded by Tanatar; but it is probably dependent upon the shape of the experimental vessel. Methane and traces of acetylene are among the products of the combustion. Mixtures of acetylene and detonating gas always explode, irrespective of their composition; traces of methane being found in the products of combustion. Acetylene, propylene, ethylene, and methane can each be decomposed by the electric spark when alone; but methane is the most difficult to break up. Thus the more easily a gas dissociates, the less detonating gas must be added to it to render the mixture inflammable. Mixtures of methane with detonating gas behave like those containing propylene. About 32 parts of methane in 100 of detonating gas make the whole non-inflammable. After the explosion, traces of acetylene may be discovered among the products.

Tanatar's idea for explaining these phenomena was to assume that the velocity of the reaction between oxygen and hydrocarbons was higher than that between oxygen and hydrogen. But at the critical points where explosion occurs, nearly all the hydrogen (all of it in the case of ethylene and acetylene) exists in the free state. Hence the oxygen does not react with the hydrocarbon as such, but with a product of its decomposition. Hydrocarbons destroy the inflammability of detonating gas, therefore, by virtue of their decomposition; the oxygen of the detonating gas then combining with the liberated carbon to form carbon monoxide.

Separation of Hydrogen from Methane.—Misteli finds that, when hydrogen is exploded, a small quantity of the gas always escapes oxidation. Working upon a gas containing 0·30 per cent. of nitrogen, combustions have only returned him 98·58 and 98·78 per cent. of the amount taken. Winkler's method of determining hydrogen by means of palladium-asbestos, Bunte's system with palladium wire at 450°C., and Hempel's occlusion process, are all accurate; but Hempel's method with palladium black allows some gas to pass. For the separation of hydrogen from methane, Winkler's method, Bunte's system, and Hempel's occlusion process all give correct results; but when the last is employed, the gas must not be led too rapidly over the palladium wire, or the temperature may rise too quickly and methane be oxidized. In the separation of hydrogen from ethane, Hempel's occlusion process gives figures which show that a little carbon dioxide is always produced. When Bunte's method is used, the amount of ethane oxidized varies considerably, according to the conditions obtaining. The author quotes eleven different analyses, the most unsatisfactory of which shows that 12 per cent. of the ethane present was oxidized; but when special care was taken, the maximum proportion lost was 3·7 per cent. In these analyses, 17·5 parts of ethane were mixed with 100 parts of air containing about 33 per cent. of oxygen. Richardt has proved that only traces of ethane are oxidized at 450°C., when the mixture tested contains about 3 per cent. of the hydrocarbon. Thus it may be said that the hydrogen can be accurately estimated by preferential combustion in gaseous mixtures containing only a little ethane; but the process has the disadvantage of diluting the gas very largely with atmospheric nitrogen whenever much hydrogen has to be burnt off.

In the last portion of his thesis, Misteli discusses the different methods that have been proposed for the estimation of benzol vapour in gas. He comes to the conclusion that St. Claire-Deville's process gives most accurately the amount of vaporized hydrocarbons present. Lunge and Harbeck's method gives lower results, because only the benzene is determined as dinitrobenzene. The figures obtained by the Pfeiffer process are high, as Korbuly has shown, because the dinitrobenzene recovered is impure, though the calculations are made for a pure yield. Korbuly represents the results given by the Haber and Oechelhaeuser process to be some 0·2 per cent. lower than those of the Lunge process; and he therefore holds the former to be too low. When, however, only small quantities of gas are available for analysis, Haber and Oechelhaeuser's process is the only one that can be employed.

Incandescent Mantle Litigation in Australia.

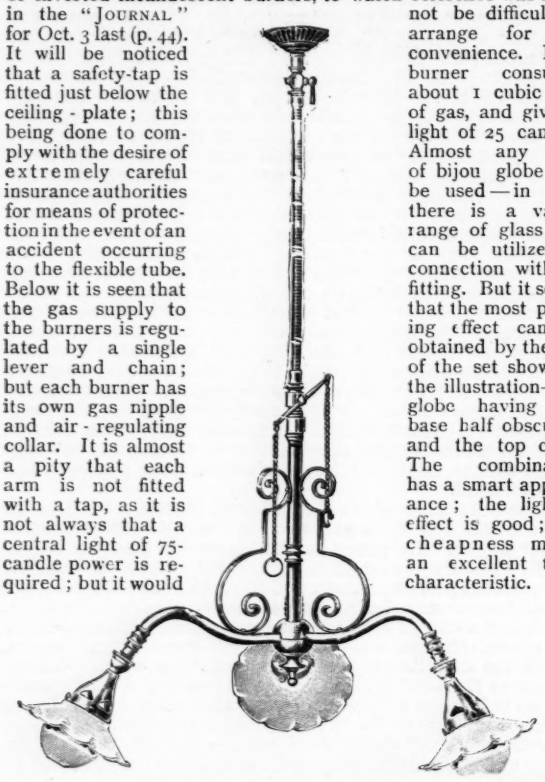
Alluding to the paragraph under this heading on p. 217 of last week's issue, a correspondent writes to express his opinion that the statements quoted from Mr. A. E. Cohen were "singularly unfortunate in phraseology and fact." His letter continues: It may sound paradoxical, but it is nevertheless true, that, "although the highest legal authorities in Australia" declare "the judgment bad," yet the highest judicial—and presumably also legal—authorities for the time being have given judgment, which, unless reversed by the Court of Appeal, must hold good. Perhaps Mr. Cohen intends us to infer that the judgment is bad so far as his Company is concerned. But, if so, his statement is lacking in lucidity, and may want qualifying. Mr. Cohen points out that "the judgment only refers to the State of Victoria . . . and that in all other Australian States . . . the Company's patents continue valid." It may suit your informant to impress this erroneous idea upon those interested in the mantle industry; but it must have been by a singular lapse of memory for this gentleman to overlook the fact that his Company have no patents for their mantle in either Western Australia or Tasmania.

The Midland Junior Gas Engineering Association will hold a meeting next Saturday, when a paper will be read by Mr. J. H. Willoughby, of Leamington, on "Cyanogen Recovery." The author will deal with the history of the subject, the sources of cyanogen, the systems of manufacture, the plant, and the commercial aspects.

Analyses of New Zealand Coals.—In some tabulated analyses of anthracite, semi-bituminous, bituminous, and brown coals given in a recent number of the "Journal of the Society of Chemical Industry," no particulars are furnished, by a curious omission, of the work of the materials for gas-making purposes, though their calorific value is stated. With regard to the class of coals available for gas manufacture—viz., those classed as semi-bituminous and bituminous—they are fourteen in number. The volatile matter varies from 22 to 45 per cent., the ash from 0·88 to 8·9 per cent., and the sulphur from 0·5 to 1·6 per cent. These figures show that the coals are of the most varied descriptions, but include many which should be very useful for gas production. The mean proportion of volatile matter exceeds that of the best ordinary English coals; but the mean proportions of ash and sulphur are low in comparison.

A NEAT COMBINATION.

The popularity of the flexible tube form of gas pendant has induced Messrs. J. & W. B. Smith, of 19, Farringdon Road, E.C., to produce a very neat combination, of flexible tube stem, ornamental brass lacquered base, and the bijou form of their "Veribest" type of inverted incandescent burners, to which reference was made in the "JOURNAL" for Oct. 3 last (p. 44). It will be noticed that a safety-tap is fitted just below the ceiling-plate; this being done to comply with the desire of extremely careful insurance authorities for means of protection in the event of an accident occurring to the flexible tube. Below it is seen that the gas supply to the burners is regulated by a single lever and chain; but each burner has its own gas nipple and air-regulating collar. It is almost a pity that each arm is not fitted with a tap, as it is not always that a central light of 75-candle power is required; but it would not be difficult to arrange for this convenience. Each burner consumes about 1 cubic foot of gas, and gives a light of 25 candles. Almost any kind of bijou globe can be used—in fact, there is a varied range of glass that can be utilized in connection with the fitting. But it seems that the most pleasing effect can be obtained by the use of the set shown in the illustration—the globe having the base half obscured, and the top clear. The combination has a smart appearance; the lighting effect is good; and cheapness makes an excellent third characteristic.



Parliamentary Elections.

The list which we gave last week of new members of Parliament who are more or less identified with the gas industry, must be extended by a few additions. The first to be named is Mr. W. J. Crossley, of the famous firm of gas-engine makers. He has gained a seat for the Government by expelling Mr. Coningsby R. Disraeli, with a very large majority, in the Altrincham division of Cheshire. By his defeat of Mr. F. S. Leveson-Gower, Mr. Alpheus C. Morton, the Chairman of the Streets Committee of the Corporation of the City of London will, after a considerable absence from the House of Commons, return to it as the member for Sutherland. Mr. Morton, it will be remembered, took the lead in ousting a number of electric arc lamps from the City streets to demonstrate what could be done in the matter of more economical lighting. Sir John T. Brunner, of Messrs. Brunner, Mond, and Co., has retained his seat for the Northwich division of Cheshire. Not only is he the head of the great firm named, but he has presided over Parliamentary Committees that have considered most important gas measures. The associate of Mr. Dugald Clerk in the firm of Messrs. Marks and Clerk—Mr. George Croydon Marks—has been returned for the Launceston division of Cornwall.

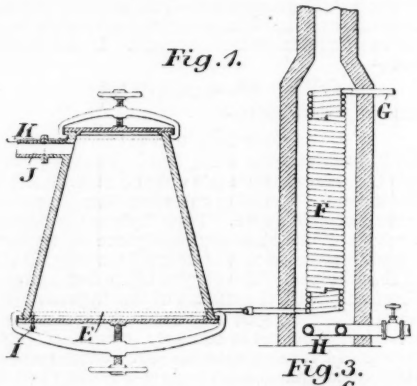
A crowded congregation assembled in Fisherton Church last Wednesday afternoon, to witness the marriage of the Rev. B. G. M'Cann and Miss C. Mabel Humphrys, the eldest daughter of Mr. Norton H. Humphrys, Assoc.M.Inst.C.E., F.C.S., the Engineer and Manager of the Salisbury Gas Company. Mr. M'Cann has for the past three years been curate at Fisherton, and has recently been appointed by the Colonial and Continental Church Society to the charge of St. John's, Kimberley, South Africa. For his future work he has in his wife a real "help meet," for, prior to her marriage, she had been a most devoted Church worker. In accordance with the expressed wish of the bride and bridegroom, the service was quiet, but beautiful in its simplicity. The officiating clergy were the Rector of Fisherton (the Rev. E. N. Thwaites) and the Rev. J. J. Haworth. After the ceremony a reception was held at the residence of the bride's father, and was attended by a large number of relatives and friends of the newly-married couple, who, later in the afternoon, left, with hearty good wishes for their future happiness, for Boscombe, to spend a short honeymoon before leaving England for their new home. Among the large number of gifts were two cases of cutlery from the staff at the gas-works, which were offered at a gathering on the 19th inst.

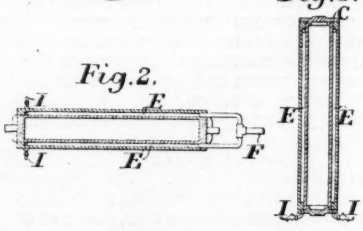
REGISTER OF PATENTS.

Destructive Distillation of Coal and other Substances.—Bowing, J., of Tilbury, Essex. No. 580; Jan. 11, 1905.

This invention relates to the utilization of superheated steam for the destructive distillation of coal and other substances. Concerning it, the patentee says that in patents granted to him Nos. 6541 and 28,498 of 1903, he described the steam as being introduced directly into the mass under treatment, but, as the result of numerous experiments, he has discovered that, when treating certain materials—such, for instance, as highly bituminous coal—the direct action of the steam upon the mass has the effect of rendering it more or less plastic, so that it becomes impervious to the steam, and, furthermore, the water of condensation which mixes with the products of the distillation has to be removed. Consequently, he proposes to apply the heat by conduction through the walls of a flue or passage through which the superheated steam is caused to flow, whereby the disadvantages named are obviated, and, as a further advantage, heat is conserved, as the water of condensation can be collected and used for supplying the generator for the steam, or otherwise utilized.

Fig. 1 is a sectional side elevation of apparatus arranged in accordance with the invention; fig. 2 is a horizontal section of fig. 1; and fig. 3 is a cross vertical section.





The retort shown is preferably of rectangular shape in plan, so that the material within it shall be of uniform thickness throughout, and is preferably formed with inclined ends, so as to facilitate the discharge of the contents. At the sides of the retort are arranged chambers or passages E, through which the superheated steam is passed. F indicates a superheater which is composed of a helically-coiled tube connected at its lower end to the chambers E, and at its upper end G to the boiler; a gas-burner H being arranged at the lower end for heating it. I are cocks arranged at the lower parts of the steam chambers or passages E, for drawing off the water of condensation. J is the pipe through which the gas generated is discharged; and K is the pipe for the escape of the superheated steam.

In using the apparatus, it is filled up to the level of the discharge pipe J with small coal or other material to be treated, and then steam of the required temperature is passed through the passage E, sufficiently fast to ensure that all parts of the surface shall be heated to a uniform temperature. The heat from the inner walls of the passages is "gradually and uniformly conducted through the mass, and, owing to their uniform thickness, very rapid carbonization takes place." When the treatment is complete, the covers are removed and the coke or other material remaining in the retort is discharged.

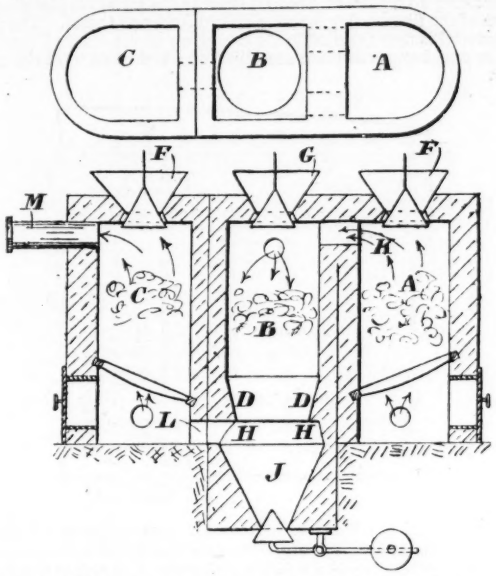
In using the retort for the destructive distillation of coal for the manufacture of lighting gas, the patentee finds it advantageous to make the retort of a width of about 6 inches and of sufficient size to contain (say) 3 cwt. of coal, and he superheats the steam to a temperature of (say) 650° C.—it being only necessary that the pressure of the steam in the boiler should be sufficient to ensure the flow of superheated steam through the passages E at such a rate that, on leaving the passages, it has practically the same temperature as on admission.

Lime Burning and Recovery of Power Gas as a Bye-Product.—Chalk Power-Gas Syndicate, Limited, of Walbrook, and Stoneham, H. S, of Cornhill, E.C. No. 2684; Feb. 9, 1905.

As is well known, the patentees remark, in burning chalk, limestone, or other form of calcium carbonate to make quicklime, considerable volumes of carbon dioxide are liberated, and it has been proposed to convert such carbon dioxide into carbon monoxide. [See patent No. 23,415B of 1899.] The present invention relates to an improved apparatus in which the carbon dioxide undergoes reduction to carbon monoxide concurrently with the process of lime burning; the gaseous products of the process then forming a "valuable power gas usable

either for direct firing, or for the production of power by means of the gas-engine."

The apparatus comprises three juxtaposed chambers A, B, C—termed respectively the gas-producer, the kiln, and the gas-reducer.



They are formed as compartments of a structure divided by partitions or be juxtaposed so as to effect the maximum practicable economy of heat. The gas-producer A and the gas-reducer C are each provided with a grate at the lower part, and with an inlet in the space beneath the level of the grate for the introduction of a blast of air, "which (more especially in the case of the gas-producer) may advantageously be mixed with steam." The air blast may be produced advantageously by means of a steam-injector, which would also serve for effecting the introduction of such steam as it may be found desirable to employ in the different stages of the operation.

Usual hopper apparatus is provided, as at F, at the top of each of the chambers A and C for the introduction of carbonaceous fuel (such as anthracite or coke, which descends and forms a bed resting upon the grate. Hopper apparatus is also provided, as at G, at the top of the kiln B, for the introduction of chalk, limestone, or other form of calcium carbonate; and at a distance of about two-thirds of the total height of the kiln-chamber from the top the internal diameter is constricted by boshes, as at D, so that the material descending through the kiln is delivered towards the centre of the cross-sectional area of the kiln, and consequently an annular space H is left between the material and the wall of the kiln, below the boshes. The lower part J of the kiln forms a hopper of inverted conical form, and is provided at the bottom with an aperture closed by a counterbalanced valve J, whereby the delivery of the lime is automatically regulated. An inlet for the introduction of a blast of air, or of air and steam, is provided near the the upper end of the kiln, as already described with reference to the chambers A and C.

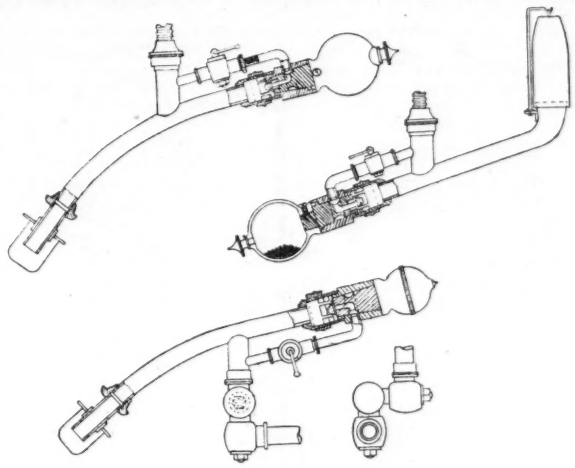
Communication is established between the gas-producer A and the kiln B by a passage K connecting the upper parts of both chambers; while a passage L leads from the annular space H below the boshes in the kiln to the space beneath the fire-bars of the gas-reducer C. M is the gas-outlet main, which leads from the upper end of the chamber C, and is controlled by a stop valve.

The action of the apparatus is as follows: The kiln B is charged with limestone, chalk, or equivalent, material, and the chambers A and C with carbonaceous fuel. The latter is brought to a state of incandescence; a blast of air, or of steam and air, being introduced, while the supplies of fuel and calcium carbonate are continuously maintained. The gas formed in the producer A is burned in the kiln B; the heat thus generated causing the liberation of carbon dioxide and the consequent reduction of the calcium carbonate to quicklime, which falls from the boshes into the space J, wherein it rests upon the counterbalanced valve J. On a sufficient quantity of quicklime accumulating, the valve is opened automatically by the pressure upon it, whereupon the lime escapes, and may be collected in any convenient manner—the valve being immediately closed by the action of the counterweight.

The carbon dioxide liberated in the kiln and the products of combustion from the producer A collect in the space beneath the boshes, and pass thence, by way of the passage L, into the space beneath the grate of the reducer C. As the gases ascend through the mass of incandescent fuel in C, the carbon dioxide is reduced to carbon monoxide, forming, with the residual nitrogen of the air which has been consumed in the process, and with hydrogen resulting from the decomposition of steam, a power gas, which escapes by way of the main M and which may be used either for direct firing or for the production of power by means of the gas-engine—the process being continuous so long as the materials are fed to the respective chambers of the apparatus.

Fittings and Burners for Incandescent Mantles.—Helps, G., of Nuneaton. No. 2805; Feb. 11, 1905.

This invention relates to fittings, burners that are not vertical, and globes, shades, and holders therefor. The inventor mentions that, in his patent No. 2733 of 1905 (see "JOURNAL" for Aug. 22, 1905, p. 507), he pointed out that atmospheric burners that are not vertical give better results when the head of the burner is not very much below the level of the gas-nipple but rather above it. Hitherto where two or three burners have been used together connected to a central body, there has been no difficulty in setting the burner-tubes at the angle necessary; but where single burners have been concerned, depending from a flexible tube or other fixture, the burner-tube has hung in a vertical line—the nipple being directly over the head of the burner, or nearly so, or the burner-tube has been bent so that the burner-head is out of plumb with the nipple. The difference in level of the gas-nipple and the burner-head being several inches, necessitated a pressure of gas of about 2 inches of water to give a satisfactory mixture at the burner-head. Further, bunsen burners in use with incandescent mantles have been generally secured to a fitting at the end at which the gas-nipple and air cone are fixed.



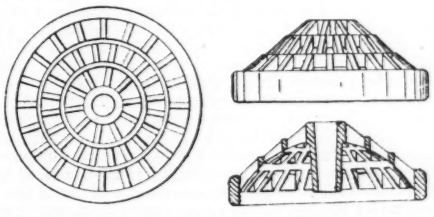
By the present invention, however, bunsen burners may be suspended at right angles, or nearly so, or fixed to a gas-fitting at any intermediate point between the nipple and the burner-head, and only the gas connection made at the extremity—a counterbalance weight being used to balance the shade, globe, or holder, and the like that may be used on the opposite side. The burner may be employed with inverted mantles, or, by bending the tube in the requisite manner, a vertical mantle may be used with it.

For example, a bunsen burner for incandescent mantles may have a connection to the gas-nipple which is distinct from the connection securing the bunsen burner in position when the latter connection is not at one extremity of the burner. Also a bunsen burner for incandescent mantles may have an intermediate connection by which the burner is secured to any fitting, and from which a connection is taken to the nipple of the burner.

When desired, swivel joints may be used in conjunction with the burners, so that they may be set at any angle and swivel round in a complete circle; also shades or globes, or both, may be used with them. Special globes or shades may likewise be fixed to holders in such a manner that the waste gases from the burner may pass away from the burner without damaging the shades—the globe-holder being hung from a pin joint connected to a bracket secured to the burner-tube, so that it, together with the globe, always keeps in a suitable position for the heated gases to pass off.

Burners for Incandescent Gas Lighting.—Bray, J. W., of Leeds. No. 5028; March 10, 1905.

This invention has for its object the construction of a burner head or tip in such a manner that a larger quantity of the mixture of gas and air may be passed through it than hitherto, "with the result that a more efficient and economical light is produced."



As shown, the burner head or tip—of brass, iron, porcelain, or the like—may take various forms and thicknesses, but not flat on both top and bottom. It may be formed either convex on its upper and under faces, such as a hollow rounded cone, or the underside may be flat, and the upper face rounded or coned, or *vice versâ*, or a portion only on either the under or upper faces, or both, may be suitably rounded off.

Through the head are pierced a suitable number of round or rectilineal holes constructed either by drilling, moulding, or in any other convenient manner. The direction of the holes must be vertical to the horizontal section of the head or tip, and not through the head or tip at an angle.

A burner-head thus constructed will have its orifices for the passage of the gas and air mixture vertical; but by reason of the head being coned or rounded either on the top or under side, or both, these orifices will be larger in area at the point where they intersect a rounded or coned portion of the head—"thus providing a freer passage for the mixture of gas and air through such orifices, by means of which a better bunsen flame is produced, resulting in a better and more economical light from the mantle."

Multiple-Way or Change Valve with Liquid Seal.—Ledoux, E., and Simon-Carves Bye-Product Coke-Oven Construction and Working Company, Limited, of Manchester. No. 7260; April 6, 1905.

This valve, which is suitable for coking or gas-making plants, or for the manufacture of sulphate of ammonia, or other manufacture where obnoxious gases have to be dealt with, consists essentially of two parts, the lower one of which, A, is provided with two openings B B^1, surrounded by upwardly projecting flanges or walls C C^1, while the upper part A^1 is preferably easily removable from the lower part and is furnished with a gas-inlet D. The two parts of the casing are connected together and a gas-tight joint formed between them. The openings B B^1 have pipes E E^1 connected with them, adapted to lead to, or be discharged at, any desired points, and suitably mounted within the

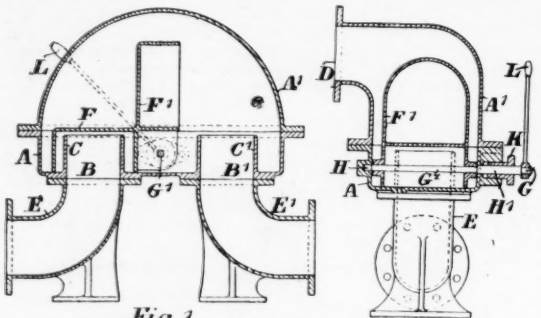


Fig. 1.

Fig. 2.

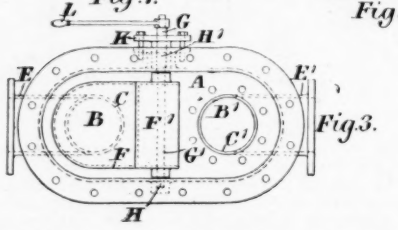


Fig. 3.

casing are two inter-connected metallic caps F F^1, one for each of the openings, and so relatively disposed that as they are moved with or around the shaft G, one of them, F, may close one of the outlets; while the other, F^1, leaves the other outlet fully uncovered. Each cap has a downwardly projecting flange or returned part adapted to surround, when in its closed position, the flanged opening of the outlet which it closes. As shown, the cap F is closing the outlet B, and no gas admitted to the casing can escape through it. The casing has liquid added to it to a sufficient depth below the level of the outlets that the flange of the cap F will dip into it and form an efficient liquid seal; and the liquid preferably extends to such a height that it covers the shaft G and the opening through which the shaft passes through the wall of the casing.

By turning the shaft a quarter-turn to the right (fig. 1), the caps move with the shaft, and the cap F is moved to the uncovering position shown as now occupied by the cap F^1; and the cap F^1 is moved down over the outlet B^1 to close and seal that outlet and occupy the position relatively thereto that the cap F is shown as occupying relatively to the outlet B. The outlet B^1 will then be closed, and the outlet B uncovered.

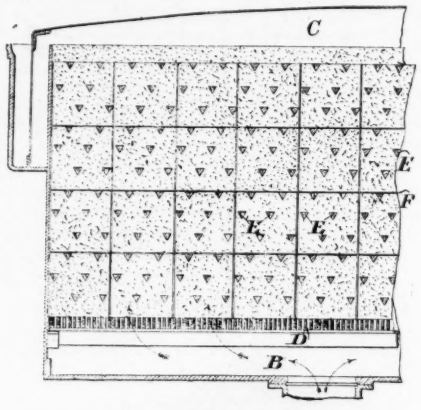
The shaft upon which the caps are mounted is preferably formed with a square intermediate portion G^1, and the boss (or that part of the caps with which it engages) is similarly and correspondingly formed for engagement with it. The ends of the shaft are formed with bearing surfaces at their ends at H H^1, one of which, H, is of smaller size than the square part of the shaft, and the other, H^1, of a diameter equal to, or larger than, the diagonal of the square part of the shaft. Thus with the caps and their boss or similar part properly in place within the casing, the shaft can be passed into the casing and into engagement with and through the boss of the caps formed with a hole for the reception of the square part of the shaft by simply passing the shaft in from the right of fig. 2. When in place, the cap and the shaft may be secured together, to prevent accidental withdrawal, by means of transverse pins passed through the shaft and part of the caps within the casing. A stuffing-box, with a gland K, is preferably provided to prevent the escape of liquid through the shaft bearings if the shaft, as is preferred, is below the level of the liquid seal, or to prevent the escape of air if the bearings are not covered by the liquid. L is the handle by means of which the caps may be moved.

Purifiers.—Cutler, S., of Millwall, E. No. 7324; April 6, 1905.

In purifiers fitted with grids on the Jäger system (Patents No. 19,644 of 1902 and No. 14,970 of 1903), the gases pass horizontally through the mass of purifying material in the manner there described; but in the present invention a similar net-like grating is used, composed of bars or slabs arranged in obliquely ascending rows—"thus maintaining the mass of purifying material in a condition of uniform density, which is an essential feature of the Jäger system"—but the use of conduits or double gratings is dispensed with, and the gas is passed through the material obliquely, instead of horizontally.

The bars are arranged in rectangular frames placed in the purifier casing in superimposed horizontal layers, but so that the individual bars form obliquely ascending rows. Distributing and collecting chambers are provided beneath and above the mass of purifying material in any convenient way—such as, for instance, by extending over the area of the purifier a tier of horizontal grids or sieves of the description ordinarily employed in purifiers—and in some cases several such distributing chambers are provided, each having superimposed a deep mass of purifying material supported in a condition of uniform density, and the gas may pass through the mass either upwards or downwards.

In making up a purifier, the first layer of the frames is placed on the bottom of the filter casing, so as to extend from end to end. The filtering material is then inserted in the casing up to the level of the layer, and the next layer is inserted and filled up; and so on until the casing is full.



The purifier shown is of the well-known construction provided with the distributing and collecting chambers B C, and with the perforated bottom D to support the purifying material. The supporting bars E are arranged, on a series of rectangular frames F, in horizontal layers in the casing and so that the bars form obliquely ascending rows.

Inverted Incandescent Gas-Burners.—Shaw, E. J., of Walsall. No. 8698; April 25, 1905.

This invention has particular reference to the construction of the regulator fitted over the air-inlets to the bunsen tube of inverted incandescent gas-burners, and to the supports for the mantle.

It has already been proposed in an inverted mantle burner to form the top of the bunsen tube coned or conical shape, or as a coned top to a trumpet-mouthed tube, and the air-inlets have been arranged both at the sides and at the top of the coned chamber; and these air-inlets have, in some cases, been covered by a revoluble lid or cover having corresponding holes of the same size as the inlet holes underneath, so that the admission of air can be regulated. The present patentee proposes to fit a lid having holes not of the same size as the air-inlets, but longer and in the form of slots, so that the admission of air cannot be stopped altogether, and thus the striking-back of the bunsen flame is prevented. The second part of the invention relates to the forked or cranked attachment for the mantle. He forms the holder with a number of arms which are first bent down and then bent up, so that a depression is formed intermediate of the length of the arm for the support of the mantle.

Incandescent Gas-Burners.—Clark, W. E., of Southfields, S.W. No. 18,197; Sept. 8, 1905.

The mixing-chamber used in this burner consists of a length of tube (open at the bottom) which tapers slightly inwards for a portion of its length and then slightly tapers outwards. Besides being open-ended, it is adjustably mounted, so as to admit of its being readily set at different heights with respect to the gas-nozzle according to the composition of the gas being burned. In the mouth of the mixing-tube is inserted, in an inverted position, a cone, of considerable length, the base of which nearly fills the mouth; and round the base of the cone cuts are made to form teeth, which may be arranged to form hooks, by which the cone is supported in the mouth of the tube. The cone, after the burner has been lighted for a short time, becomes so hot that the mixture of gas and air striking on it will be warmed before it reaches the point of combustion, and "a comparatively high illuminating power results."

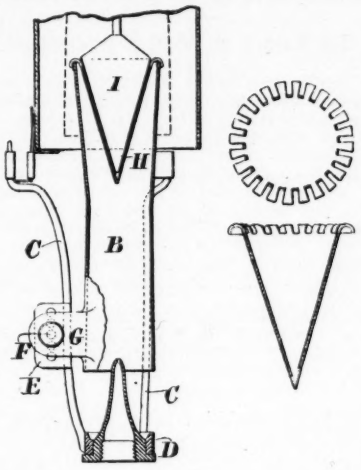
The gas-nozzle (of any convenient construction) delivers the gas into the mixing-tube B—a tube of the following dimensions and construction: It may have a total length of $3\frac{13}{16}$ inches, and for a distance of $2\frac{1}{8}$ inches may taper slightly inwards from $\frac{15}{16}$ inch to $\frac{13}{16}$ inch, and then taper outwards for a length of $1\frac{11}{16}$ inches from $\frac{7}{8}$ to $1\frac{1}{8}$ inches.

The tube is supported by the rods C (p. 295), which are attached to a collar D secured to the gas-nozzle, so that its position with relation thereto may be adjusted. One of the rods is provided with a plate E, to which the burner-tube is secured by the set-screw F fitted to gripping lugs G on the tube. By these means, the mixing-tube may be raised or lowered in relation to the gas-nozzle, so as to increase or decrease the supply of the air to be admitted according to the quality of the gas—the open end of the tube providing a clear way for the entrance or exit of the nozzle.

H is the inverted cone (which may be hollow), the length of which (for the burner referred to) may be about $1\frac{1}{2}$ inches. The base of the cone is notched, as shown, so as to provide teeth curled over to form hooks by which the cone may be supported from the top of the burner or mixing-tube. The notches at the base of the cone should be radial, and the diameter of the cone at the roots of the teeth should be slightly less than the diameter of the mouth of the mixing-tube. When the cone is inserted in the mouth of the tube B, the notches form outlets for the combustible mixture and "ensure complete admixture of the constituents;" while the incline of the cone will obviously give the flame a

direction outwards on to the mantle—thus "ensuring the complete incandescence of the mantle."

I is a plug, of any suitable material, to fit into the hollow cone for the purpose of carrying the mantle support.



The lower part of the mixing-tube may be cylindrical in place of taper, but the patentee thinks that the length of the burner should not exceed 4½ inches. The length of the cone, as well as the diameter at the root of the teeth, may also be capable of slight modification.

According to the construction described, the necessity for using gauze discs to ensure the mixture of the gas and air and to prevent lighting-back, is avoided.

Pressure Regulating Device for Compressed Gas Plants.—Aktiengesellschaft für Gas und Elektricitat, and Karger, L., of Cologne. No. 22,959; Nov. 9, 1905.

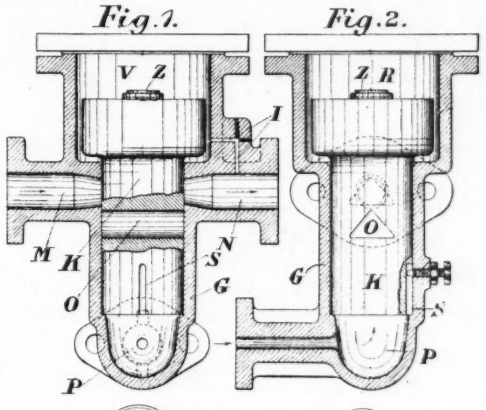
This invention relates to compressed gas plants, in which gas supplied from the street-main is compressed and conducted to the respective lamps, since the pressure of gas in the main is too low for the lamps. Such compressed gas plants are of the kind in which a suction reservoir is connected with the main and serves for storing up the gas under ordinary pressure, while a compressor is employed for sucking the gas from the reservoir and forcing it under greater pressure into a delivery reservoir, whence the compressed gas is conducted through a pipe system to the several lamps—it being optional to insert somewhere an apparatus for mixing the compressed gas with air. As the number of the lamps in use, and, consequently, the consumption of gas, may vary, and as it is essential that the pressure of the compressed gas should remain practically invariable, pressure regulators are usually employed. The invention relates to a pressure regulating device in which, "in opposition to known pressure regulators," a piston is employed and placed under the control of the compressed gas "for regulating the supply of gas from the suction reservoir to the compressor by returning the excess of the compressed gas to the suction pipe, in case the pressure of the compressed gas exceeds a certain limit."

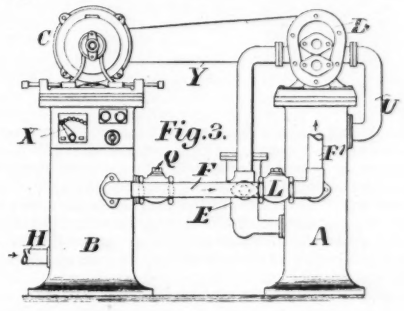
Figs. 1 and 2 are vertical sections through the pressure regulating device. Fig. 3 shows the compressing plant in which the regulating devices are employed. Fig. 4 is a horizontal section through the compressor. Fig. 5 is a vertical cross section seen from left to right.

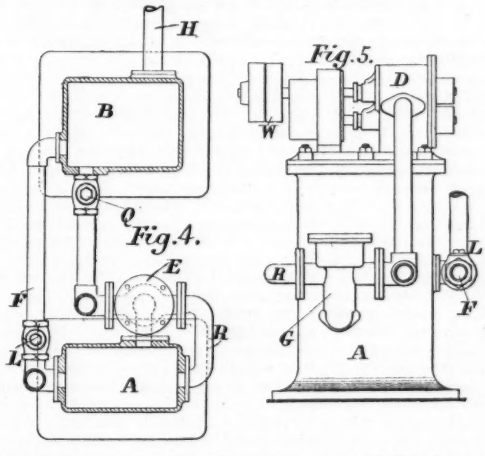
The plant shown comprises a suction-reservoir B, a gas-compressor D, a delivery-reservoir A, and a pressure regulating device E. The suction-reservoir is connected with the gas-main by a pipe H, and with the compressor by a suction pipe, and the latter is connected with the delivery reservoir by a bent pipe U. The delivery reservoir is connected with the pipe which conducts the compressed gas to the respective lamps. This delivery pipe is shown as at the same time connected with the suction-reservoir by a pipe F and a connection. A check valve L is inserted between the pipe and the connection, for a purpose to be explained later on. A check valve Q is also inserted between the suction-reservoir and the suction-pipe. The compressor (of any known construction) is arranged to be driven from an electro-motor C by a driving belt Y and a fast pulley W.

The pressure regulating device E consists of a casing G and a piston K. The casing has a cylindrical part, in which the piston is vertically guided. The space P beneath the piston is put in communication with the delivery reservoir A, through a narrow channel and an opening. The piston is shown as provided with a head of large diameter, which plays within a space V in the casing. On the top of this head a buffer Z, of leather or elastic material, is secured, which is arranged for striking against the cover, and serves for diminishing any blow. The piston normally rests on a shoulder of the casing; and its stroke is limited by the cover. The casing has two tubular connections M and N, in the same horizontal axis, at right angles to the piston, and the latter is provided with a cross channel O, which can register with the two connections in the uppermost position of the piston. Preferably the cross channel is triangular in section. The upper space V in the casing is put in communication with one connection N through a narrow channel I; and in order to prevent the piston from turning, it is provided with a longitudinal slot S, in which the point of a screw engages. Thereby the cross channel is maintained in the vertical plane of the two connections M and N, so that it may register with the latter with safety. The flange of the connection M is connected with the corresponding flange of a bent pipe R, the other flange of which is fastened on the delivery reservoir A; and the flange of the connection N is connected between the two suction-pipes.

The compressing plant in combination with the pressure regulating device operates as follows: The suction-reservoir B is filled with gas under ordinary pressure; and normally the gas is conducted through the pipe F, the check valve L, the connections, &c., to the pilot-lights of the lamps. In this case, of course, also the delivery-reservoir A, the delivery-pipe U, the pipe R, and the space P in the device E will be filled with gas under ordinary pressure. The weight of the piston K is so adjusted that it requires an excess of the pressure (equal to that in the delivery reservoir A) of the gas beyond the maximum determined for lifting the piston. On starting the electro-motor C, the compressor D will commence to suck gas under ordinary pressure from the reservoir B through the check-valve Q, and force it, under a greater pressure, through the pipe U into the delivery-reservoir A. The increased pressure of the gas in the delivery pipe will close the check-valve L, so that the latter prevents the compressed gas from returning to the suction-reservoir B. Of course, the increased pressure of the gas in the space P of the casing G will act upon the piston, but without producing any visible effect, so long as the pressure is beneath (or only equal to) the maximum pressure; and the lamps may be all or partly turned on, when a greater or smaller quantity of the compressed gas will be consumed. In case all the lamps are not burning, the pressure of the compressed gas will exceed the maximum determined, so that this excess of the pressure will lift the piston, which then moves upwards until it strikes against the cover, when a full communication will be established between the two connections M and N through the cross passage O. Thus compressed gas passes from the delivery-reservoir A to the suction-pipe U, where it mixes with the gas under ordinary pressure, and the total pressure will be reduced.





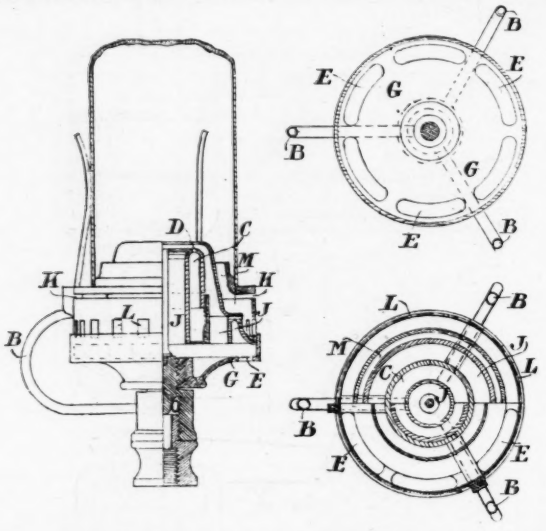


As long as the consumption of the gas is not large, a part of the compressed gas may repeatedly pass through the compressor, while the latter will suck only a reduced quantity of gas under ordinary pressure from the reservoir B. In proportion to the pressure of the compressed gas within the reservoir A decreasing and increasing, the piston K will sink and reduce the area of the cross channel O, or it may go upwards and increase the area, whereby the pressure of the compressed gas is regulated. The gas within the space V may serve as a cushion for retarding the upward motion of the piston, and the narrow channel I serves for balancing the piston, as it prevents the formation of both an over-pressure during the upward motion of the piston and of a vacuum during its downward motion.

Burner for Testing Gas.—Carpenter, C., of Old Kent Road, S.E. No. 24,828; Nov. 30, 1905.

This invention relates to argand test burners, and is an improvement upon that described in patent No. 13,553 of 1905 [see "JOURNAL" for Oct. 17, p. 183].

With the argand burner there described, a method was shown whereby the supply of air to the inner and outer surfaces of the flame was simultaneously regulated by raising or lowering a controlling disc. When the attachment is applied to tri-current burners in which an additional supply or supplies of air to the flame are provided, it may sometimes be desirable, says the patentee, to make such supply or supplies also adjustable. For this purpose, the controlling disc carries at its edge a sleeve or flange (placed at right angles), which covers or uncovers a series of ports or orifices that communicate in turn with the channel conducting the separate or additional supply of air to the burner. The operation of raising and lowering the controlling disc varies the rate of flow of all three supplies of air, and "enables the best conditions for combustion to be attained."



The gas, as supplied to the burner, passes by the tubes B into the chamber C, whence it issues, by a ring of holes D, and is consumed as a hollow flame in the usual manner. The air admitted to the inner and outer edges of the flame passes through passages E formed in a disc G provided with a threaded socket so that it can be raised or lowered—thus diminishing or increasing (as required) the flow of air through the passages J. The additional current of air which tri-current burners require is admitted to the passage M partly by the channel K, and partly by ports L.

For the poorest gases, the channel K provides sufficient air; but when richer gases are required to be consumed, the lowering of the disc G, by which more air is given to the outer and inner edges of the flame, also uncovers the ports L and admits an extra supply of air to the channel M.

APPLICATIONS FOR LETTERS PATENT.

1039.—LYNDE, F. C., "Burners." Jan. 15.
1070.—FISCHER, F., "Inverted gas-lamps." Jan. 15.
1072.—M'RAE, J., and INGRAM, H., "Supporting globes." Jan. 15.
1074.—BURRELL, J. E., "Actuating gas-cocks." Jan. 15.
1083.—GILL, J., "Blowers or meters." Jan. 15.
1100.—LAKE, H. H., "Gas-producers." A communication from E. N. Trump. Jan. 15.
1101.—QUENEAU, A. L. J., "Charging retorts." Jan. 15.
1104.—PRICE, C. W., "Gas-stoves." Jan. 15.
1140.—BLAKEY, J. W., "Anti-vibrator." Jan. 16.
1146.—CORBRIDGE, W., "Gas-fittings." Jan. 16.
1185.—SMITH, H. E., "Gas-producers." Jan. 16.
1190.—BOURNE, H., "Gas-heated soldering iron." Jan. 16.
1224.—POTTER, W. G., "Inverted lighting." Jan. 17.
1228.—ATKINSON, T., and SIEGENBERG, L., "Inverted burners." Jan. 17.
1257.—BLAKELEY, W., "Tar-fog extractor." Jan. 17.
1282.—SIMPSON, S., "Dry meters." Jan. 17.
1295.—MASCHINENFAB. UND MÜHLENBAUANSTALT G. LUTHER AKT.-GES., "Gas-producers." Jan. 17.
1315.—GALLINAGH, J., "Gas-producers." Jan. 17.
1331.—GOEHTZ, H., "Gas-generators." Jan. 17.
1368.—MEARING, F., "Acetylene generators." Jan. 18.
1387.—COOK, E. S., and CHIPPERFIELD, W. H., "Gas irons." Jan. 18.
1409.—COLBRAN, J. B., "Gas-lamps." Jan. 18.
1411.—GASGLÜHLICHT GES. HAMBURG M. B. H., "Mantles." Jan. 18.
1417.—DOWSON, J. E., "Gas-generators." Jan. 18.
1454-5.—KEITH, J. & G., "Gas-lamps." Jan. 19.
1480.—SIMPSON, S., "Meters and fittings." Jan. 19.
1496.—CLERK, D., BICKERTON, H. N., and BRADLEY, H. W., "Internal combustion engines." Jan. 19.
1556.—CORTHÉSY, J. H., "Gas-turbines." Jan. 20.
1561.—BRÖNDUM, M. V., "Igniting and extinguishing device." Jan. 20.
1565.—DICK, W., "Gas-heaters." Jan. 20.
1575.—OECHELHAEUSER, W. VON, "Vertical gas-engines." Jan. 20.

CORRESPONDENCE.

[We are not responsible for the opinions expressed by Correspondents.]

The Future of the Gas Profession.

SIR,—The two correspondents in the current number of the "JOURNAL," though agreeing to some extent with me, leave the main issue to discuss other matters. Had Mr. W. Upton read my communication of five years ago, he would have observed that our agreement was similar on still further points. I said on that occasion: "No doubt some will remark that the fault rested a good deal with the men themselves;" and I also pointed out the necessity of impressing upon gas proprietors that the day of the "working manager" was gone, and that a better-class person is now to be obtained, &c. Granting a dearth of scientific ability in the past, where have the brainy efforts of practical utility, such as luteless purifiers, stoking machinery, and slot meters, emanated from? Surely they were not dug up on the Continent.

My chief grievance arises again on reading once more the address of a worthy Past-President of the Institution of Gas Engineers, where the following appears: "The Institution should furnish to all a symbol of brotherhood in an honourable profession, . . . and should bind the leaders to the humblest members in one cordial spirit of loyalty and mutual helpfulness. . . . This spirit we know largely exists. It is the special mission of the Institution to foster and develop it." This, I believe, was the sincere desire of the speaker; but his words must have fallen on deaf ears. Nothing has come of it, and apparently never will, unless those who can do something will be aroused to the necessity. The remedy rests with the Institution to move in the matter. Why should not gas proprietors, who are compelled to pay Trade Union rates of wages, and generally see that contractors employed by them do the same, be made to pay their head officials in proportion to their responsibility? Of course, I know well enough such changes of fiscal policy need considerable debating, and that is why, in response to "Lux" and others, I attempted to keep the ball rolling.

If it is necessary for me to propose a scheme, I have no temerity in doing so, by saying that every gas undertaking ought to pay in salaries, including collection, an amount equal to not less than 2d. per 1000 cubic feet of gas sold (not made), and this on works of 10 million cubic feet per annum capacity and upwards—exclusive of a house, &c., generally provided—to (say) works of 50 millions capacity. Two or more of the smallest works should amalgamate to do any good to either their proprietors or those employed by them. I find, in taking an average of recent published statistics, that all salaries and collection amount to slightly under this figure. But what wide divergences exist among the individual works. A wealthy company in the South is paying 2¼d. per 1000 cubic feet, while another undertaking, with an identical output of gas, in the North, close to the pits, is only paying 1½d. The latter is owned by the local authority.

I did not take the trouble to write previously on behalf of "Contented," the front rank, the man in a thousand, or even the old Act of Parliament man of whom we have often heard with awe-struck and mixed admiration, but for the great majority—the willing horses who get all the work and very little corn. Neither do I wish to voice any complaint of my own, because I have performed similar common enough feats of dexterity, and had my salary raised in a befitting manner, as described by "Contented," only that I did them in half the time that he says it took him. But, having converted a very cantankerous and obstinate Board into a body of most docile and affable gentlemen, I hardly think their metamorphosis is so complete that I dare tell them to obtain a better man if they are not satisfied with me, although I have written proof that they would be loth to part with me. I sincerely trust that "Contented's" stokers feel likewise, with eight hours and no Sunday work. If this panacea for contentment does not exist on those particular works, I piously hope that Thorne and Co. will pass an Act of Parliament shortly to enforce it everywhere.

Competition was as keen in our business in regard to applications for vacancies twenty years ago as it is to-day; and competition is no excuse for intelligent men having to submit to accepting berths for foremen's wages. I feel very strongly on the matter; and I know many others do the same. Our thanks are due to you for allowing us to ventilate these feelings, in the hope of obtaining an improved prestige for our profession, and of infusing among us a little brotherly help, and less of the selfish and "every man for himself" spirit that is all too prevalent.

Jan. 25, 1906. ONE OF THE PRESENT.

Brentford Gas Company.—The Directors of the Company announce that the balance at the credit of the net revenue account for the six months ending Dec. 31 will enable them to recommend dividends of 5, 12½, and 9½ per cent. per annum—carrying forward, £57,912.

Municipal Gas and Water Supply in Leipzic.—According to a paragraph on "Municipal Engineering in Germany" in the Engineering Supplement to "The Times," the output of gas from the Leipzig works in the current year is estimated at rather more than 1000 million cubic feet; of coke, 65,000 tons; and of tar, 6000 tons. The profit is put at £38,000. The water-works provide for an annual consumption of 3000 million gallons. The consumers pay at the rate of about 10½d. per 1000 gallons. The profit is put down at £10,000.

Cardiff Water-Works Assessments.—The Water Engineer to the Cardiff Corporation (Mr. C. H. Priestley) has just presented to the Corporation a report dealing with the assessments of the water-works property owned by them in the Pontypridd, Merthyr, and Brecon Unions. The assessments at present are as follows: Pontypridd, £2283; Merthyr, £2488; and Brecon, £13,494. These figures are considered too high, and it has been decided to send a deputation to the Assessment Committees of the respective unions and to seek a reduction; and it is thought that nearly £3000 is likely to be obtained.

LEGAL INTELLIGENCE.

HIGH COURT OF JUSTICE—KING'S BENCH DIVISION.

(*Before Mr. Justice* BIGHAM *and a Special Jury.*)

Wednesday, Jan. 24.

Mason and Others v. Commercial Gas Company.

This was an action for damages for personal injuries on the ground of alleged negligence. It was the second trial; the first, which came before Mr. Justice Wills, having proved abortive, on account of the Jury being unable to agree.*

Mr. A. POWELL, K.C., Mr. DRAKE, and Mr. WOOLF (instructed by Messrs. Dyson, Smith, and Marchant) appeared for the plaintiffs; Mr. ELDON BANKES, K.C., and Mr. G. WALLACE (instructed by Messrs. Holland, Sons, and Coward), represented the defendants.

Mr. POWELL, in opening the case, said the plaintiffs were James Mason and his wife and daughter; and the damages claimed were for injuries to person and property arising from an explosion of gas, which it was alleged resulted from the imperfect fitting of a penny-in-the-slot meter. In May, 1904, there were complaints of an escape of gas, and some change was made in the fitting; but in June the smell became worse. Further complaints were made; and on the 9th of July Mrs. Mason complained personally to one of the defendants' servants, who said he could not attend to it, and told her to write to the Company. She sent a post-card that day; but next morning (a Sunday) when Mrs. Mason was using the ring of the cooking-stove, an explosion occurred. She was thrown down and injured, and various articles of crockery were broken. The husband, an omnibus driver, was out at work, and did not return home until the evening; but two men in the Company's service came in very soon, and examined the stove, the supply-pipe, and the meter. One of them said: "Here's where the mischief was;" and they took away the supply-pipe leading to the meter, which stood on a bracket against the wall. It was suggested that the leak was at the union joining the iron service-pipe to the lead pipe supplying the meter. The latter pipe the men took away, capping the pipe, and it had never been brought back; a new piece of pipe being put in its place. About ten o'clock in the evening, the men came back accompanied by two inspectors, one of whom suggested that Mrs. Mason had left one of the stove taps on. This she at once repudiated. The following morning men came and fixed a pipe in place of the one which had been removed, and it had remained in use ever since. The stove was not injured in any way or disturbed, and if the explosion had occurred there, it was difficult to see why the pipe was removed; and, further, if there was no defect in the pipe, why was not the same pipe sent back and refitted? The questions for the Jury to decide would be how the explosion was caused, and the amount of damages, if the defendants were found to be liable.

Mrs. *Alice Mason* said she resided at No. 190, High Street, Bromley-by-Bow. In 1902, they had a penny-in-the-slot meter fixed, and also a stove. There was a little trouble with the first meter, and in 1903 a new one was put in. At one time there was a complaint of a smell of gas, and an india-rubber tube which conveyed a supply to a separate ring burner was changed, and the smell ceased for a time. In May, 1904, there was again a smell of gas; and she spoke to the collector about it. Nothing was done, and she complained to the meter inspector in June. She also wrote a letter, which she thought must have been in June, and her husband posted it; but she had no reply. On Saturday, July 9, there was a bad smell of gas, and she mentioned it to a man named Stock, who was working in the street, and asked him to come in and look at the gas, as it was so much worse that she was afraid her children would be suffocated. He said he was busy, and could not come in; and told her to drop a line to the Gas Company. She then sent off a post-card. It was shortly after beakfast when she spoke to Stock, and she posted the card between two and three o'clock. The smell continued very strong. On the Sunday morning, at eleven o'clock, her daughter Lily was the only person in the house with her. She was cooking the dinner at the kitchen fire, and she lit the ring on the top of the gas-stove to boil some peas. She heard a kind of whistling noise, and her daughter asked what it was. Immediately afterwards there was a loud report, and she was rendered unconscious. A neighbour (Mrs. Lee) came in shortly afterwards, and a little later two of the Company's men (Stock and Harrison) came in. She was then in the kitchen. The men looked first at the meter and then at the pipe, and said: "Here's where the trouble lies." They took the pipe down, blew through it, and laid it on one side. Then they took down the meter, looked at it, and put it back again. They took the pipe away with them. She had not used the stove at all that morning—merely the ring on the top. She had only used it about three times since she had had it. It was between one and two o'clock when the men came; and they said nothing as to the stove or the taps. About half-past eight they came again; but she did not see them. On the first visit, Stock said if he had known it was as bad as that he would have come in on the previous day. The witness then gave particulars of her injuries, which included damage to her eyes.

In cross-examination, witness said her age was 39. The kitchen was 10 ft. 9 in. by 12 ft. 6 in. It had a fireplace, on which she did most of her cooking. There was a tap which shut off the gas before it entered the meter, and she turned that off when she recovered consciousness. She did not usually turn off the tap, but always turned it off from the stove when not in use. Besides the stove, she had a ring burner which stood on the kitchen range, and was constantly in use; it was connected by an india-rubber pipe. The kitchen windows were always left open. The smell was constant, but was worse if the windows or the door were shut. There was never an occasion during the month before the accident, that the smell was not perceptible. The gas in the oven came through a number of small holes; and if it escaped there, it would hiss. She knew of no other place where it would hiss. It was a short time—perhaps a quarter-of-an-hour—after the tap had been turned before the hissing noise was heard. She saw no mark on the wall immediately behind the chimney-hole of the stove after the explosion. Witness was here cross-examined as to her answers on this point at the former trial, and she said she did not remember giving them. Since the explosion there had been no cause of complaint, except that one bedroom burner had to be changed. She spoke about the smell of gas to Mr. Parkins, one of the Company's officers, and to several others. Witness was then cross-examined in some detail as to the post-card she sent on the 9th of July, and on her interview with Stock in the morning of that day, when he was working at a neighbour's house; but she adhered to the account she had given. She did not recollect saying, "Take it away;" but she might have done so.

Re-examined: Various men came to collect the money and read the index; but they never gave their names. She had not used the oven for a long time before the explosion; she was quite sure the oven tap was not turned on that morning. Some crockery and glass which were a good way from the stove were broken; and a large looking-glass in the scullery was shattered.

James Mason, the husband of the previous witness, was next called. He said there was a strong smell of gas for some time before the explosion occurred. He recollected posting a letter to the Company some weeks before. He did not see any of their men on the Sunday morning, but he did on the Monday morning. They examined everything, and found all perfect except the missing piece of pipe, which they had forgotten to bring; and one of them went back for it. He (witness) had to go to work before they had restored it. His wife's eyesight had been affected by the accident, and he had had to buy her several pairs of glasses.

Cross-examined: He took no steps to complain of the smell of gas beyond posting the letter. He detected the smell every night when he came home, and he several times went round and examined all the burners. He did not turn the gas off at the main. He posted the letter about three weeks before the explosion; but it had nothing to do with the india-rubber pipe. He did not have much conversation with the men on the Monday morning, and said nothing to them about the stove. There was no mark on the wall behind the stove. His wife did not always know what she was saying, particularly when she was hurried.

Lily Mason, the daughter, also spoke of the smell being present for about a month before the explosion, and said it became gradually worse. She was in the kitchen with her mother on the Sunday; and saw her light the boiling-ring, and put on the peas. In about 20 minutes she heard a whistling noise, and asked her mother what it was; and she said she did not know. Almost immediately—within two or three seconds—the explosion occurred. Witness was hurt, but not so much as her mother. About half-past one, two of the Company's men came; and her mother was in the kitchen. The men pointed to the meter and remarked: "That's where the trouble lies." They took down a piece of pipe, and then the meter. One held the pipe, and the other blew through it; and they took it away with them. At ten o'clock, Stock, Harrison, and two inspectors came; but she did not remember them coming at eight. They examined the fittings, and one of the inspectors said to her: "The taps are on." She said they were not. She did not look, because she knew they were not on before the men came, as she had looked at them. Both inspectors went up to the parlour where her mother was lying on the sofa, and asked her what was the matter. She said her back was hurt. She (witness) had to go to a doctor; and she had never been the same since the explosion as before.

Cross-examined: It was a fortnight before she could resume her duties as a waitress; she had been at work ever since. She got up about ten o'clock on the Sunday, and was in and out of the kitchen all the morning. Dinner was to be ready at half-past two; and the explosion happened about a quarter past one. It might have been ten minutes after the gas was lit that the explosion occurred. The whistling seemed to come from the meter or from that corner of the kitchen. It was near the stove. She saw her mother turn off the gas, but did not see the men do so. The men pointed to the meter when they said "That's where the trouble lies." She did not see whether they examined the stove, as she was attending to her mother. She did not hear them say anything about the taps being left on, or her mother say "Take it away." She said on the previous trial that when the men took down the pipe she saw a slit in it; and she did see it, as they were standing close to her. [The pipe was handed to witness, and she pointed out where she saw the split, a longitudinal one, about 2 inches long, close to the union.] She was quite sure about it; she was just as positive on the former occasion; but she was got into a corner. [A passage from the evidence was read, in which witness said she was almost sure.] It was a split into which one could put a penknife; and anybody could have seen it. She did not say anything about the split to Stock. The smell was constant.

Re-examined: She had never heard the hissing noise before the morning of the explosion.

Thursday, Jan. 25.

On the resumption of the hearing this morning,

Mr. *S. Alexander*, L.R.C.P., gave evidence as to Mrs. Mason's injuries. He said he was called to see her on July 10, 1904, and found her suffering from shock; and she had a bruise on the back. He attended her for six months. She was in bed six weeks, and suffered from headache and sleeplessness. At the end of six months she had greatly improved; but she had lost flesh, and her eyesight was impaired. He saw the daughter in August. She had hemorrhage of the stomach; but he did not say that it was caused by the shock.

Mr. *A. Watson* said he went in October, 1904, to inspect the gas-fittings at the plaintiffs' house. The stop-cock on the main was 5 feet or a little more from the floor; he could reach up to it. It was a basement room, 7 ft. 3 in. or 7 ft. 6 in. in height. There was no injury to the stove. The two taps supplying the rings turned easily; but the one supplying the oven did not—it was stiff. The only part of the

* See "JOURNAL," Vol. XC., p. 593.

fitting that had been interfered with or altered was the connecting-pipe, with a union at each end; the portion including the stopcock had been removed. He could see there had been a new joint made. He afterwards attended at the defendants' Solicitors' office, with Mr. Stanton, another gas-fitter, to inspect a pipe which was said to be the one which had been removed. [Pipe produced]. He believed that was the pipe he saw. A few days ago he went to No. 108, High Street, and removed the pipe which was then there, and now produced it. It was the same that was there in October, 1904, and was now exactly the same shape as it was then, so that it would exactly fit again. The other one would not fit in its present state; it would have to be bent. If there were an imperfect union, it might get worse or not according to the nature of the defect. He saw nothing which would account for the explosion. The only thing which had been altered was the pipe he had mentioned. The one he found at the house was not so good as the one he saw at the Solicitors'. He was struck by the peculiarity of the union with the stopcock; the unions to the meter were the same. The union to the stopcock now in use was not of the kind usually employed for such a purpose. The other seemed quite perfect; and he could not see any reason why it should have been taken away. His suggestion was that the one shown him was not really the one which had been removed. If the explosion had taken place inside the oven, there would undoubtedly have been signs of it, and the stove would have shifted. It was impossible that an explosion could have taken place in the stove.

Cross-examined: A piece of pipe produced to him seemed to be the same as that of which the two other pieces produced were made. He never heard that the girl had seen a crack in the pipe. If there were a split in the place suggested, it must have been there from the beginning, and there would have been a constant escape of gas. A split might expand and contract; the split might appear on the outside, and not go quite through; but subsequent vibration might cause it to open. After his examination he made a report, in which he suggested that the Company had substituted what he called a forged pipe. He heard a part of Mr. Stanton's evidence at the previous trial, but not all of it. [The witness's report to the plaintiffs' Solicitors was read, in which he suggested that there was a defect in the supply-pipe, and said he should like to see it.] He did not make any inquiries of the tenants when he inspected. He was a gas and hot water fitter and sanitary engineer, and at present was working on a large estate in the East-end at weekly wages. [The other report made by the witness was then read, in which he again suggested that the defect was in the connecting-pipe.] That was the first report he made. He came to this conclusion because the pipe had been removed. If the taps had been turned on, it would have caused an explosion; but the stove would not have been there. Counsel then read a joint report by witness and Mr. Stanton after inspecting the pipe at the Solicitors' office. In it he said the pipe was removed about two hours after the explosion. He could not say who informed him, but he inquired at the house. He did not make any inquiries until after his inspection. The report went on to suggest that the pipe shown was not the actual one removed, but a duplicate taken from stock. He also said the fittings on the house side of the meter were of a different class of workmanship from those on the other side. He also said the pipe did not smell of gas. At the previous trial, he admitted that one end of the pipe did smell; but probably when at the Solicitors' office he smelt the other end which did not. He still adhered to the report in substance, and the opinion that the pipe produced was not the one removed. He did not believe it was possible. The pipe would not fit in its present shape, and they were told that the pipe had been very carefully preserved. He saw no indications of the explosion on the walls of the room; the paper behind the stove was not injured. If there was a constant escape of gas, it would tend to accumulate near the ceiling; and it was impossible to say when it would explode. Gas coming through the holes in the oven would cause a hissing noise.

Re-examined: Gas coming through any small orifice would cause a hissing or whistling noise. A pipe might split from the outside not quite through; and it might afterwards go through by vibration. A crack in the end of a pipe might be made, even by a good workman, in expanding it to fix a union.

Mr. *W. Stanton*, a gas-fitter, was next called, and, in answer to his Lordship, said he agreed generally with the last witness.

Mr. POWELL said he would take witness's evidence very shortly.

Witness said he signed the report which Watson drew up. He could form no opinion how the explosion could have occurred, except from a defect in the L fitting, and he could see no reason why the pipe should have been removed if it were not defective. The one shown to him at the Solicitors' office was superior to the one now in use.

Cross-examined: He remembered what he said at the previous trial—viz., that he thought it a wrong thing to have signed the report; that he did not charge the defendants now with having deceived him; and that he withdrew the charge of forgery. [A long passage from his former cross-examination was read.] He did not think he said the explosion must have happened in the stove, if the pipe was the same.

Re-examined: He did not think the pipe he saw was really the one which was removed, though he did not charge anyone with forgery. If the explosion took place in the stove, there would have been some signs of it; and they saw none.

Mrs. *Lee*, of No. 104, High Street, Bromley-by-Bow, spoke to having smelt gas in Mrs. Mason's house a few days before the explosion. When it occurred, she went in and was there when the defendants' men came. One of the men, Stock, said he wished he had come in on the previous day. They went to the meter, and Stock said to the other man: "This is where the mischief lies." After they had taken the piece of piping out, they looked at the stove and at all the fittings in the house. When they went away, they took the pipe with them. She was there when they came again about eight o'clock. Stock had a pick and shovel, and was going to do something in the road; but he asked her if everything was all right now. When she said "Yes," he did not do anything. About 10 o'clock, two inspectors came. One looked at the stove and said: "This is where the explosion took place." She said: "Don't take me for a fool."

Cross-examined: She did not give evidence at the previous trial. She attended, but was too late. Her attention was mainly directed to Mrs. Mason. Her face was black, and she was very much upset and hysterical. She (witness) was occupied with her, and did not see everything the men did. She could not say whether the first thing they did was to turn on the stopcock and test the connecting-pipe with a light. They pointed to the meter and the pipe. She did not hear Stock say anything about the taps, or hear Mrs. Mason say "Take it away," or anything like it. Stock did not have any conversation with Mrs. Mason, He was well known in the neighbourhood, and was generally sent for if anything was wanted.

Re-examined: Stock said nothing to her about the taps; the first person to mention them was the inspector. She had had to write several times to the Company in order to get anything done,

Miss *Kate Larking* said she visited the Masons, and had often detected a smell of gas there, especially a month before the explosion.

Some of Mrs. Mason's neighbours having given evidence as to smelling gas, the case for the plaintiffs closed.

Mr. BANKES said there were three questions for consideration—first, whether the defendants were responsible for doing repairs, which it would be for his Lordship to decide; the second, whether the plaintiffs gave notice; and the third, which was most important, what was really the cause of the explosion. This was a very serious matter, because it involved the question whether someone in the defendants' service had been guilty of gross fraud with respect to the pipe which had been removed. He should submit that the explosion took place in the stove, and was not caused by gas from the pipe. He dwelt on the point of the hissing noise heard just before the explosion, which would have been going on continuously if it was caused by a leak at the union. He also submitted that the smell of gas must have been grossly exaggerated, or the main stopcock would have been turned off. Counsel went on at some length to outline the defendants' case, which will appear better from the evidence.

Stephen Stock, a service layer in defendants' employ, said he laid the iron services from the mains into the houses; but with the inside connections he had nothing to do. He lived quite near the plaintiffs. He remembered in November, 1903, a complaint about the meter not working. It was on a Sunday, and as he was sent for he went, though it was not his regular duty. After that date he never spoke to Mrs. Mason. On the 9th of July he was at work at No. 114, High Street, putting in a service; and his mate Williamson was with him. He was not at work outside the house. There was no trench open. Mrs. Mason did not speak to him at all that day. On the Sunday, about half-past one, Mrs. Mason's little boy told him there had been an explosion. He went to the house, calling for Harrison on his way. He had his bag and tools with him. He found Mrs. Mason and Mrs. Lee there, but not the daughter. Mrs. Mason was very much upset. They went to the meter and found the tap was turned off. Mrs. Mason said she turned it off. Harrison turned it on, standing on a chair. As soon as it was turned on, the index hand moved; showing that there was an escape on the house side of the meter. Harrison said: "That's where the mischief is." He then traced it to the stove, and found that the taps had been left on there. The main tap was partly on, and the ring and the oven taps were full on. He pointed this out to Mrs. Mason, and asked if she had been using the stove and she said "No." He said she must have been. He shut the taps off, tried a light everywhere, and found nothing; and the index stopped as soon as they turned off the taps. They tried the other taps in the house upstairs; but Mrs. Mason was not satisfied, and said several times: "Take it away." They then disconnected the pipe and capped the service on the stopcock, which was left in position. They then went away, and he took the connecting-pipe with him in his basket. He saw at the back of the stove a big black mark, the paper torn, and the plaster split. He saw no other mark in the room of any damage except the crockery and glass. He denied having said what Mrs. Lee had stated. He went back about half-past eight with Harrison to see if it was all right. They went in and tested the service and found it was. He had no pick and shovel with him; he had no pick at home. He then went and informed Mr. Stericke, the inspector, of what had occurred; and he, with Mr. Smith, a foreman fitter, went with him to the plaintiffs' house. They saw Miss Mason. Mr. Stericke asked her what had caused the explosion, and whether she had been using the stove. She said her mother had been cooking peas. Mr. Stericke told her that the explosion must have occurred in the stove through the tap being left on. Witness informed Mr. Stericke why he had removed the pipe. The one now produced was the one he took away. It was in perfect condition then, the same as it was now. He took it in to the Company's offices on the Monday morning, and gave it to Mr. Stericke between ten and eleven o'clock. If he had been asked on the Saturday to go in and see to an escape, he should have gone. The instructions were to leave any other work to attend to an escape.

Cross-examined: This was not a new order, made since the explosion. His ordinary work was with iron pipes; but he had removed a good many connecting-pipes. He generally gave them to Mr. Parkins, the fitter; he had never given one to Mr. Stericke before. He did not remember ever blowing down such a pipe, or seeing another man do it. He was surprised to find the stove tap on. He was sure the oven tap was turned on. He gave evidence at the previous trial. [A passage was read, in which witness said he asked what had happened.] He and Harrison came to the conclusion that the explosion had been caused by the taps being left on. He called the attention of Mrs. Mason to the fact. Mrs. Lee could have seen it if she had looked. He did not think Mrs. Mason wanted him to take away the thing which had caused the explosion, or he should have taken away the stove.

By the FOREMAN: He took away the part which was always removed when gas was cut off. He went back in the evening to see if it was all right when the pressure was on. He was quite sure Miss Mason was not there the first time he went to the house. He did not know why the same pipe was not put back, or why any pipe was taken there, if Mrs. Mason wanted the gas cut off. There was nothing the matter with the stove; he thought the explosion took place outside the stove. He made a report to Mr. Stericke, who probably told the clerk what to enter in the book.

Re-examined: He and Harrison signed a statement. He thought Mrs. Mason wanted the gas cut off when she said "Take it away."

Walter Harrison, a service layer, corroborated Stock's evidence. He was the one who tested the pipe with a light. His evidence at the former trial was read, and he said it was correct. He did not speak to Mrs. Mason—it was Stock; he heard what was said.

Mr. *R. B. Stericke*, District Inspector in the service of the defendants, said he had been with the Company 35 years. Stock reported the explosion to him on the Sunday evening, and he went for the foreman fitter, and then to the plaintiffs' house. He saw Miss Mason, who told him they had been cooking peas on the top of the stove. Stock showed him how the taps were when they went, and he said this must have been how it happened. Stock turned on the taps to show how he found them. He saw, just behind the flue of the stove, about 9 inches of paper and plaster broken and displaced. There were some panes of glass broken in a bookcase on the opposite side of the room; but there were no marks on the walls or ceiling, except just behind the stove. Stock had not reported the removal of the pipe; but he saw it was gone, and told Stock to let him have it, as it was part of the property of the Company. The next morning he reported to the Chief Engineer. Stock brought in the pipe about ten o'clock on Monday morning, and he kept it in his possession until he took it to the Solicitors. Before this he had it tested. He corked up one end and tested it with gas under about 7 inches pressure. He afterwards tested it under water. The pipe was not straightened for this purpose; it might have been bent a little in handling, but not materially.

Cross-examined: He did not keep any record of the test; and he could not say exactly when it was made, and could not be sure whether or not he did it at Messrs. Hollams' suggestion. He had instructions from Mr. Jones, the Chief Engineer, but they might not have been in writing. He told Stock to bring the pipe because it was the Company's property; and he thought he had better keep it in his cupboard. He tested it to see if it was sound. It was not necessary to straighten the pipe in order to test it; and he did not recollect that it was done. Four people were present. An account of the explosion was entered in the stove-book. Stock's report to him was oral.

Re-examined: He took it down in writing and made Stock sign it. This was when he brought in the inlet-pipe on the Monday morning. [The report was read. It stated that he found the oven cock turned on full.]

Further cross-examined: The paper was not produced at the first trial. He was sure the report was taken down at that interview.

Justice BIGHAM pointed out that Stocks had not said anything about turning on the taps at ten o'clock in the evening, to show Mr. Stericke how he had found them in the morning.

Mr. POWELL: Nothing was said about it at the former trial.

Stocks re-called, in answer to his LORDSHIP, said that he turned the taps to show Mr. Stericke how they were. He called Lily Mason and showed her. There was no crack in the pipe when he took it away.

Mr. *S. Musto*, the Assistant Superintendent of the Company's stove department, said his superior, who was called at the previous trial, had since died. He (witness) went by instructions to see the fittings after the explosion; and finding them all right, and Mr. Mason saying he wanted the gas connected again, he sent his man to get a pipe and make the connection. He did not know till he got to the house that the pipe had been removed.

Cross-examined: He could not remember what he said at the previous trial, but he was sure Mason asked to have the gas laid on again, whether or not he said so before.

Re-examined: Until he got to the house he did not know the gas had been cut off. He should not have re-connected it except on request.

Robert Charles Deeley, a fitter, spoke to fetching the connection and fitting it.

Friday, Jan. 26.

On the resumption of the hearing this morning, the first witness was

William James Parkins, the fitter who put in the new meter at the plaintiff's house in November, 1903. He said he tested the inlet-pipe on that occasion, and it was quite tight; there was no sign of any crack.

Cross-examined: When he fitted the new meter, he did not remove the inlet-pipe, only unscrewed the union at the meter.

By the JURY: When connecting a new meter, they always tried all the joints. The capacity of the meter was 18 cubic feet an hour.

Mr. *H. Hills*, F.C.S., said he was Chemist to the defendant Company. He had heard an account of the explosion, and thought that the evidence favoured the idea of it having taken place in the stove, rather than in the atmosphere of the room, the cubical contents of which was about 900 feet. The capacity of the oven was less than 2 cubic feet. The explosive limits of gas and air were from 5 to 28 per cent. of gas to air. With 5 to 6 per cent. of gas, the explosion was very feeble; from 12 to 15 per cent., the force was greatest. The whole of the top of the room would have to be filled with an explosive mixture before it could take fire from the ring on the stove. There would be 600 cubic feet in this portion of the room; so that there must be 30 cubic feet of gas before it would explode, or the full capacity of the meter for an hour and a half, and much of it would pass out through the window. If the mixture were 15 per cent., the whole room would have been wrecked, and anyone in it killed. If the mixture were only 5 per cent., the explosion would be much less violent, but probably equally fatal to life from burning. An explosion might take place in such a stove without making any marks on the stove itself.

Cross-examined: There was no limit to the supply of gas from the main; and if the union were loosened sufficiently, the gas would escape and cause a hissing sound.

This concluded the defendants' evidence.

Mr. BANKES said he had not been able to fix the date when the pipe was tested, but he found that when Messrs. Hollams suggested that it should be tested they were informed in December, 1904, that this had been done. Counsel then proceeded to sum up the case for the defendants; again emphasizing its importance, owing to the serious issue raised. He commented in some detail on the evidence, and submitted that it had been proved beyond all reasonable doubt that the explosion took place in the stove itself.

Mr. POWELL having replied on behalf of the plaintiffs,

Justice BIGHAM summed up, going over the whole of the evidence, and pointing out that the onus of proof lay upon the plaintiffs.

After a few minutes' consultation in the box, the Jury retired at 3.20 and returned at 4.50, and handed a written communication to his Lordship. After reading it,

Justice BIGHAM said: All I can say is I want you to find a verdict for either the plaintiffs or the defendants. I have told you unless, as indicated by me, you have been satisfied by the plaintiffs' evidence that negligence has been brought home to the defendants, your verdict must be for the defendants. If you are satisfied that negligence has been brought home to the defendants, and that the injury complained of was the consequence of that negligence, then your verdict must be for the plaintiffs. I cannot have an argumentative verdict; you must find for either the plaintiffs or the defendants.

The Jury again consulted, and then returned a verdict for defendants. Judgment was accordingly entered for them, with costs.

Monday, Jan. 29.

At the sitting of the Court this morning, Mr. WOOLF, asked his Lordship for a stay of execution on the ground of misdirection, and that the verdict was against the weight of evidence. The point of misdirection appeared to be founded on something the learned Counsel thought his Lordship had said about the evidence of plaintiffs' two expert witnesses.

Justice BIGHAM said it was an entire misconception. He had said nothing of the sort; and if he had, it would not have been misdirection, but an incorrect statement of the evidence, which the Jury could have corrected. With regard to the verdict being against the weight of evidence, he should certainly have given the same verdict himself, and on the ground mentioned by the Jury in a paper they handed in, on which he might have directed a verdict. In that paper they said they were satisfied there had been an escape of gas for some time before the accident, but they were unable to come to the conclusion that it was due to any negligence on the part of the defendants. He told the Jury that unless there was negligence, the plaintiffs had no case. This might be misdirection; but he did not think it was, as the case was founded on negligence. He might add that if Mr. Woolf wanted to go to the Court of Appeal, the present judgment against him with costs would be no obstacle, because he (his Lordship) did not believe for a moment the defendants would ever take the trouble to tax their costs. It would cost them a considerable sum of money to do so, which they would never recover. He refused the application, but said nothing as to the costs.

HIGH COURT OF JUSTICE—REFEREES COURT.

(*Before Mr.* MUIR MACKENZIE.)

Ocean Accident and Guarantee Corporation, Limited, and Others v. Ilford Gas Company.

This action, which was last referred to in the "JOURNAL" for Dec. 19 (p. 839), was resumed on the 22nd inst., and judgment was delivered on the 27th, after a hearing of twelve days. The cause of action, it will be remembered, arose from the same flooding as that which has been referred to in the case of the East Ham Corporation against the same defendants.

Mr. MONTAGUE SHEARMAN, K.C., and Mr. D. C. LECK appeared for the plaintiffs; Mr. H. E. DUKE, K.C., and Mr. SYLVAIN MAYER represented the defendants.

On resuming the evidence for the defendants on the 22nd inst.,

Mr. *S. Jackson*, an architect living at Ilford, was called. He was examined as to the building of a Board School in the immediate neighbourhood of the plaintiffs' houses, the site of which was "practically a marsh." He said it was most unsuitable for building purposes. The soil on which the houses were built was waterlogged. The dampness complained of was due to faulty damp-courses and the absence of concrete over the site.

Mr. *A. R. Stenning*, F.R.I.B.A., said he knew the district well, and had examined one or two of the houses. They were "carelessly built." The damp had been bottled up by papering. The cracks found were such as one would expect to find in this class of property. In cross-examination, witness said he did not think water soaking through the soil would tend to disintegrate it.

Mr. *W. B. Farquhar*, Assistant-Engineer to the Gas Company, gave evidence as to the strata found in boring an artesian well on the gas-works. He said London clay was reached about 20 feet down.

Mr. *A. E. Christy* and Mr. *Douglas Young* gave expert evidence in confirmation of the nature of the soil, the character of the houses, and the cause of dampness. Their evidence was to the effect that the dampness was not due to the flood, but to the marshy grounds, the houses being built too low, and faulty damp-courses. Detailed figures as to the valuation of the property were also given and cross-examined upon.

Mr. *E. K. Burstal* (Messrs. Stevenson and Burstal) was the last witness; and he spoke as to the unprecedented rainfall of June, 1903. He said the River Roding was itself full at the time of the flood, and could not have carried off the water from the Gas Company's premises. After cross-examination as to the carrying capacities of the Roding and the Aldersbrook, he said, in re-examination, that the discharge of water was absolutely controlled by its rate of flow. The effect of tidal water, to which the Roding was subject, was to prevent the water coming down. In any case, there must have been a flood into the marshes.

Mr. DUKE last Wednesday summed up the case for the defendants, commenting upon the claim for £3000 for internal repairs to the houses, another £3000 for expected subsidences, and £6800 for depreciation.

Mr. LECK replied the following morning for the plaintiffs, and judgment was delivered on Saturday.

The OFFICIAL REFEREE decided that the site of the houses was unsuitable unless special precautions were taken, and these were not taken. The foundations were not enough, nor were the concrete and ventilation sufficient. The forecourts were receptacles for water, and all this tended to depreciate the property by damp. There was no more depreciation than was ordinarily to be expected. There was, however, some damage due to the flood; but an award of £156 15s. was adequate to satisfy all claims for damages. Costs would not be allowed for any claims which should not have been made, and the Taxing Master would be directed to disallow the costs of prosecuting such claims as for loss of rental, subsidences, and depreciation.

East Ham Corporation v. Ilford Gas Company.

Judgment was also delivered in this case on Saturday morning. The hearing had extended over eight days, and was reported in Vol. XCII. of the "JOURNAL," pp. 692, 763. The reference was to ascertain the amount of damages (if any) suffered by the Corporation owing to a flood for which the defendant Company had been held liable. At the opening of the reference, the plaintiffs asked for £913, which itself was a substantial reduction from the first amount claimed. At the close of the hearing, it was reduced to £747; and, as will be seen from the summarized judgment below, the award was fixed at £120.

Mr. MONTAGUE LUSH, K.C., and Mr. L. M. RICHARDS appeared for the plaintiffs; Mr. H. E. DUKE, K.C., and Mr. SYLVAIN MAYER represented the defendants.

The REFEREE, in giving judgment, briefly reviewed the facts of the case. On June 13, 14, and 15, 1903, there was a heavy fall of rain in the valley of the Roding; 3·57 inches being evenly distributed over the three days. A volume of flood water was brought through the defendants' works, which became submerged. The river wall was overflowed, a breach was made in it, and the water ran over the streets of the Corporation. The Jury, in the trial before the Lord Chief Justice, found that the defendants were liable; and the amount of damages was to be assessed. He next considered the principles of law relating to the finding of damages, and pointed out, as the result of the cases considered, that the pecuniary amount of the damage due to the rain was to be deducted from the total damage. The two main heads of damage were repairs to roads and depreciation in value. The Corporation could not claim for the roads themselves, but only for the excess amount expended to repair them. This was chiefly for ballast, rolling, and cleansing the streets. The money expended by the Corporation on the roads in the year 1905 could not be considered due to the flood of 1903; and the Referee said he should allow nothing in respect of work done in the former year. He then commented on various detailed items of the claim, showing that some of them had been inaccurately described, and had broken down in cross-examination. One item which originally was put down for "pumping out sewers" turned out to be for repairs to a fire-engine. Such a manner of shaping a claim, said the Referee, could not be approved of. As to the Corporation's sewage works, some damage had been caused by the inrush of water; but only emergency work could be claimed for, and establishment charges were not in the purview of damages. The distribution of disinfectants to the inhabitants was no part of the statutory duty of the Corporation, but for disinfectants used in the streets the expense was recoverable. Generally, a great part of the claim made was unreasonable; but, taking a broad view of the case, £120 would be allowed the plaintiffs for all damage. The costs incurred unnecessarily since the date of the trial would be disallowed; and the Taxing Master would be directed accordingly. There would be liberty to apply as to any special item of costs.

Knowles v. Metropolitan Water Board.

This action, which was before Mr. Justice Buckley, in the Chancery Division of the High Court of Justice, on the 12th inst. (*ante*, p. 174), was brought by Mr. T. F. Knowles, the owner and occupier of a house and garden fronting on the Thames at Hampton for an injunction to restrain the defendants from causing a nuisance by sending oil into the river from their pumping-station just above his premises, whereby it was alleged that great injury was done to his property, and its value seriously diminished. On the previous occasion, an amended defence was put in, and the case adjourned till the 26th inst. When it came before his Lordship on Friday, it was stated that the Board had executed certain work which, in the opinion of engineers consulted by the plaintiff, would effectually prevent the injury complained of, so long as things were properly managed; and upon payment by the defendants of the costs plaintiff had been put to, the action would be discontinued. His Lordship sanctioned this arrangement.

Winding Up the New Export Incandescent Company, Limited.

In the Chancery Division of the High Court of Justice last Wednesday, Mr. Justice Warrington had before him a petition by creditors (Messrs. Weiss and Biheller) of the above-named Company for a compulsory winding-up order, on the ground that there had been fraud in the carrying on of the business, and especially fraudulent preference in issuing two debentures just before a resolution for voluntary liquidation was passed. Mr. Cave, K.C., M.P., who, with Mr. Luxmore, appeared in support of the petition, related the circumstances which had given rise to it. He said the creditors wished to attach the two debentures and to have an investigation of the business of the Company to see what had become of the assets during the past twelve months. Mr. Vernon, who represented other creditors whose debts amounted to £1500, supported the petition. Mr. Gatey, on behalf of the Company, offered explanations in regard to the debentures, and stated that the Company had suffered by having their assets destroyed by fire. As there were no assets, he submitted that a compulsory order ought not to be made. His Lordship, however, said he was not at all satisfied that there were no assets. He considered the case a clear one for an order; and he accordingly made it.

Smart Sentences on Prepayment Meter Thieves.

At the Birmingham Quarter Sessions, two labourers named Meakin and Smith were charged with getting through a grating into a cellar and stealing 3s. 2d. from a prepayment gas-meter. A police constable stated that on the night in question he heard a crash, and proceeding to the spot found the prisoners getting over some low roofs. He captured Meakin; but Smith got away at the time, though he was subsequently arrested, and found with pennies in his boots and stockings. Meakin pleaded guilty, and stated that Smith had nothing to do with the offence. He said that he and Smith went down an entry to sleep, as they were without means. Smith at once went to sleep; and he (Meakin) robbed the meter without his companion's knowledge. The Jury, however, found Smith guilty. A second indictment of a similar character was not gone into. An official of the Birmingham Corporation said that at the time of the robbery about one hundred similar depredations per week were taking place. Meakin was sentenced to eight months' hard labour, with a year's police supervision, and Smith to nine months' hard labour, and a year's police supervision.

Claim by a Gas-Works Labourer.

At the Bow County Court, last Friday, his Honour Judge Smyly had before him an action brought by John Jermaine against the Gaslight and Coke Company, to recover damages for injuries sustained in his work. Plaintiff stated that on the 27th of June last he was engaged with two other men in filling trucks with coal, and then pushing them to the retort-house. When he was about 30 feet away from the turntable, there was a hole about 2 ft. 6 in. deep at the top of the metal of the iron plates. He was walking along on the top of the breeze, pushing the truck, when he came to the hole, and fell into it, severely hurting his shin and his back. He was taken to the doctor and then to the London Hospital, and eventually to the Mile End Infirmary, where he stayed about three weeks. He was a casual labourer; but he thought his wages averaged 30s. a week. In cross-examination by Mr. R. Vaughan Williams, who (instructed by Messrs. Monier-Williams and Robinson) represented the defendants, plaintiff said he knew that, when the stokers had shovelled away a certain quantity of breeze, there was left a bit of a hole. Thomas Saint said he was engaged with the plaintiff on the 27th of June. He knew there was a hole, but passed it, got to the far end, and then worked back. His Honour said he thought this evidence put the plaintiff out of Court. He must give judgment for the defendants, with costs. It was pointed out by Mr. Vaughan Williams that, under the Workmen's Compensation Act, the plaintiff had been tendered 6s. 2d. a week, which he refused, saying it was not enough. His Honour awarded him this amount for fourteen days after the accident until the 22nd of January, when he had practically recovered. The costs were ordered to be taxed and set off the one side against the other; his Honour allowing the costs of four doctors, and leaving the Registrar to settle the amount.

Sidmouth Gas Company and the Rolling of the Roads.

Considerable correspondence has taken place between the Sidmouth Gas Company and the Urban District Council respecting the conditions on which the contract for the lighting of the streets is to be renewed. Recently complaint was made by the Council of the failure of the Gas and Water Companies to properly repair the roads after breaking them open. On the other hand, the Gas Company said the heavy roller used by the Council had damaged the Company's mains and services; and in the negotiations respecting the lighting contract, an attempt has been made to introduce conditions limiting the use of the steam-roller. The Council contended that this was really irrelevant to the matter in hand, and pressed for certain concessions with reference to price, hours of lighting, &c. In his last letter on the subject, which was read at a meeting of the Council on Friday, Mr. Douglas, the Manager of the Gas-Works, said he did not agree that the use of the steam-roller on the roads was irrelevant to the correspondence concerning the lighting contract. He had conceded every point put forward by the Lighting Committee, except that in regard to a special reduction in price, which he could only agree to on condition that an arrangement was come to about the use of the steam-roller. The Company had suffered severely by the use of the heavy roller belonging to the Council; and he suggested that a lighter roller should be substituted for the present one. The Council referred the letter to the Lighting Committee.

Bradford Gas and Water Finances.

According to the abstract of accounts for the year ended March 31 last, which has just been issued by the Bradford City Treasurer (Mr. G. A. Thorpe), the income of the gas fund revenue account was £289,515, and the working expenses £229,117—leaving a gross profit of £60,404. After charging interest and sinking fund, a net loss was sustained of £1820. The revenue appropriation account was credited during the year with £5000 from the profits of the Bradford Exhibition, and charged with £7500, being the amount voted towards the cost of erecting the Cartwright Memorial Hall. The balance of unappropriated profits is shown at £4320, in addition to which there is to the credit of the restoration fund £25,000, and depreciation and renewal of mains £8000. The net profits of the gas undertaking since its acquisition by the Corporation have been £474,642; and this, with the exception of a balance of £4415, has been utilized in reduction of the rates and for the benefit of the citizens in other directions. The total income on the water fund revenue account was £170,025, and the working expenses £35,903—leaving a gross profit of £134,122. After charging interest and sinking fund, however, there was a net loss on the year's working of £11,258. The total sum expended on capital account is £3,500,769; the amount borrowed is £3,604,549; and the amount of loans redeemed is £554,960. The remaining debt is £3,049,589. There is standing to the credit of sinking funds for further liquidation of debt £57,584.

MISCELLANEOUS NEWS.

INCANDESCENT LIGHTING IN EDINBURGH.

A Reply to Mr. Simmance's Report.

Mr. G. A. D. Mackay, the Inspector of Lighting at Edinburgh, has addressed to the Convener and members of the Lighting and Cleaning Committee a report on "Incandescent Lighting in Edinburgh: Its Introduction, Extension, and Results, with a Rejoinder to Strictures of Mr. John F. Simmance." This, of course, refers to the report drawn up towards the end of last year by Mr. Simmance on the public lighting of the city, which was reproduced in the "JOURNAL" for Dec. 19.

INCANDESCENT LIGHTING.

Mr. Mackay states that the first experiment in incandescent lighting was carried out in 1895, when an installation of nine lanterns was set up in Nicolson Square. After a trial covering seventeen weeks, a report was submitted which was not quite favourable to the new light. He, however, emphasized the fact that the period over which the experiment was extended was too short to warrant definite conclusions, and suggested suspension of judgment.

Some time thereafter a few incandescent lamps were placed in several parts of the city; but the question of their general introduction was not seriously entertained until 1903, in which year a large extension took place, and another is now in progress. Since the date of the experiment referred to, the general equipment of the incandescent light has undergone a great improvement. The lanterns are altogether more suitable for the purpose than those used in the experimental stage, with the further advantage that there is an increase in the durability of the mantles. Anti-vibrators have been introduced where likely to be effective, and the ordinary lamp-post is being superseded by the root pillar, which is less liable to swaying. At the present time the lighting world is exceedingly active in quest of further improvements; and in Edinburgh nothing of a promising nature in this direction is being lost sight of. A good deal is claimed for the inverted burner; and Mr. Mackay is taking practical measures to test its qualities. Twelve of these burners were in operation at the end of the year; and they are about to be increased to forty-eight.

The number of incandescent lamps in use on Dec. 31 was 4152, made up as follows: 348, 2-feet; 12, 2½-feet; 3742, 3-feet; and 50, 4-feet. At the date referred to, the total number of lamps throughout the city was 10,140; the percentage of incandescents being 40·94. By the end of the current financial year, the incandescent lamps will number about 4714, or 46 per cent. of the whole. Apart from cable-car routes, which are lighted with electricity, there are numerous streets with heavy traffic which require to be well lighted; and this is secured by the 3-feet incandescent burner. For side streets with a comparative absence of high tenements, and for residential parts of the city where there are open spaces, lighting with a 2-feet burner gives satisfactory results. Angles and crossings, however, in connection with such streets require more attention; and such places are lighted with the 3-feet burner.

A serious item in the expenditure on incandescent lamps is the mantle; and it is important to ascertain exactly the amount of wastage under this head. With this view, a careful record is being kept of the mantles used. Taking the twelve months ending Dec. 31 last, the consumption of mantles to each lamp was 9·03. The superiority of the incandescent burner over the flat flame is, says Mr. Mackay, too apparent to require commendation. The cost, however, is a great deal more. Each incandescent lamp involves an annual expenditure of about 41s.; while that of the ordinary lamp is 32s., or 9s. less.

In his first report on incandescent lighting, Mr. Mackay indicated that, in the event of this light becoming general, an addition to the lamplighting staff would be required. He has been slow to make any considerable request in this direction, as the lighting of the city is in a state of transition; but with an installation of over 4000 lamps now in operation, and the number being gradually increased, the request for additional assistance cannot any longer be delayed. At present the lamplighting staff numbers 92 men. Two men are, besides, employed in fixing and renewing mantles; and two in the conversion of ordinary gas-lamps into incandescents. There are two overseers engaged in the work of supervision; but with the growth of the city and the greater attention required for incandescents, their hands are full. The work of adjusting the incandescent lamps is too delicate and intricate for the average lamplighter, and requires practical men like gas-fitters or plumbers. The responsibility for 1000 lamps would be a fair charge for each man. At present the duty of attending to the burners and mantles of 4000 lamps devolves upon two men; and two additional men for this work are urgently needed.

Mr. Mackay points out that there are difficulties in the way of carrying out the proposal that the whole of the ordinary gas-lamps should be superseded by incandescents within a period of two years. This would result in an immense number of globes being thrown aside, and would lead to considerable loss, as they are not to any extent a realizable commodity. If, however, the conversion went on at the rate of 2000 lamps per annum, many of the globes could be used to replace breakages, and a more favourable opportunity would be offered to dispose of the rest to the best advantage.

But, strange to say, it is asserted in the same breath that every street in Edinburgh which has incandescent gas is admirably lighted; and the lighting so satisfactory that it may be regarded as a standard for street illumination. To put it mildly, the statements seem contradictory, and hardly reconcilable. The allegation is that, owing to insufficient maintenance, only a little more than one-half of the regulation quantity of gas is utilized for illumination; and yet, despite this, the lighting results are so excellent as to leave nothing to be desired. Everything is comparative, and doubtless with increased expenditure an improvement in maintenance might be effected. The present maintenance, however, can hardly be described as intolerable, in view of the reporter's admission that the streets are admirably lighted.

It is possible, owing to causes preventable and unpreventable, that the entire quantity of gas paid for is not represented in the illuminating strength of the lamps. But before assuming the existence of waste, which is really indeterminate and purely speculative, it were well to ascertain definitely whether the regulation amount of gas is being received. On this point, however, there is no light to be had from the report of Mr. Simmance; and, to say the least, it is surely unfortunate that on a matter of such vital importance the expert should be silent and the Corporation left in the dark. That is to say, they know what amount of gas is paid for, but are at sea as to whether it is obtained. One thing is clear—that on account of the varying pressures throughout the city, the maximum of illuminating efficiency is not continuously obtained. The expert states that the minimum pressure is 2 inches and the maximum 4¼ inches. The variations obtain not only in different districts, but even in these districts during different hours, making it impossible to have a steady and unbroken maximum of efficiency in all parts of the city. So long as the pressure does not fall below 15-10ths, the light is not unsatisfactory; but does it never fall under this figure?

On Dec. 15 last, Mr. Herring, in a communication to the Lighting Department, says: "You may take it from me that it would be a most unlikely thing for the pressure to be less than, or even as low as, 15-10ths in any of our public lighting districts." In, however, a letter dated the 12th inst., he says: "It is quite possible for the pressure to drop below 13-10ths or 14-10ths in some places." The pressure of gas as supplied to the public lamps should be periodically tested—say, once a month, during the winter season, to enable the governors to be regulated to suit the varying conditions.

The question of maintenance, though doubtless of first importance, has to be looked at from a practical standpoint. Regular cleaning, timely attention to mantles and burners, and upkeep of the lantern in a state of efficiency, are the objects aimed at. The mantle, however, is the *crux* of the incandescent lamp. Hitherto the department has endeavoured to exercise economy in this direction, renewing at once all mantles incapable of continuing a fair light, and retaining for a little longer those in only the initial stage of fraying or weakening. But if the Corporation see fit to authorize a more generous use of mantles, effect will gladly be given to their wishes.

Apart from subsidiary strictures, which are dealt with later on, the salient points raised by Mr. Simmance in connection with the incandescent lamps are two in number. The first is to overcome, by improved maintenance, the alleged waste of gas; and the second to displace the 3-feet burner by making the 2-feet one general over the city. The answer to the first is that the maintenance which he desiderates would involve additional expenditure; that such expenditure might even exceed the value of the alleged unutilized gas; and, further, that, in view of his admission that the streets are admirably lighted, the extra gas is not required. In short, the expenditure on maintenance might be carried to such an extent as to make incandescent gas as costly as electricity.

Mr. Mackay urges the desirability of definitely fixing upon the respective numbers of 2 and 3 feet burners, and remarks that the public rate per 1000 cubic feet for incandescents is 2s., and for ordinary flat-lamps 2s. 5d.; whereas for private consumption it is 2s. 9d. Taking into account the varying requirements of the streets still to be overtaken with incandescent lighting, he is of opinion that, if the lighting is to be satisfactory, the situation on completion of the conversions would require to approximate the following: 4500 3-feet lamps, 500 2½-feet, and 5800 2-feet—total 10,800. As to the charge for gas, it is, he says, very desirable that the current ratio of price to that of private consumption should be maintained. The public charge for incandescent gas is eight-elevenths of the rate for private consumption; and it would be satisfactory to have a guarantee for the continuance of this arrangement.

In concluding this portion of his report, Mr. Mackay remarks that the wisdom of not rushing the incandescents is to-day more than evident. The price of the lantern has fallen by about one-half; and this, with a smaller consumption of gas than was at one time proposed, makes the general all-over cost some 50 per cent. less than it otherwise would be. The incandescent lamps, giving a better illumination than the ordinary flat-flame ones, admit of wider spacing; and in view of this light becoming general, such an arrangement will in future be carried out where new lamps are required. This will result in a lessened proportion of lamps to space, and so will be in the interest of economy.

THE ANSWER OF THE LIGHTING DEPARTMENT TO MR. SIMMANCE.

On the subject of Mr. Simmance's report, Mr. Mackay says that owing to a lack of natural sequence and precision of statement in the reporter's mode of expression, it is not in all cases quite easy to gather his real meaning. This holds true of his remarks on the condition of the incandescent lamps. It is frankly admitted that a first reading of his observations on these is fitted to leave the impression that he is bringing a serious indictment against their management. This impression, however, is largely corrected by a further and more careful perusal, in which it is seen that his opinions are to be reached only by carefully construing his statements as a whole, and avoiding undue prominence to isolated passages. In order to make this clear, the following extracts from the report are submitted in parallel columns:—

Disapproval.	*Approval.*
"They (the incandescent lamps) are a great improvement naturally on the old flat flames; but in most cases nothing but disapproval can be expressed of them as specimens of incandescent lighting."	"In every street where incandescent gas is used, the roads are admirably lighted, even with the lanterns in their imperfect condition."
"I state definitely that at least 40 per cent. of the gas expended on the lamps is wasted."	"In fact, if the consumption of gas of each were reduced to 2 feet, and the mantles and lanterns properly maintained, the light would still be excellent, as good in most cases as at present."
"I must state that in any district in London where the maintenance is in the hands of a private contractor, the Local Authorities would not for a single week tolerate the condition of things with regard to incandescent gas-lamps which prevails in Edinburgh."	

The "disapproval extracts" say that the majority of the lamps is not sufficiently maintained; that 40 per cent. of the gas is wasted; and that such condition of things is intolerable. The answer to the second is, as already indicated, that the 2-feet burner is suitable for side streets or others with an absence of heavy traffic, and also for residential quarters of the city with open spaces; but for busy and important thoroughfares not electrically lighted, the 3-feet burner is a necessity.

It has to be remembered that the incandescent lamp, while a great improvement on what it is displacing, has not the reliability of the electric light, which remains undisturbed by storm and frost. Under a severe frost, a proportion of the gas-lamps is liable to darkening; and the wind, which so frequently asserts itself in Edinburgh, has a specially injurious effect on incandescent lights. In view of these interruptions to continuous illumination, some allowance, with even the most approved maintenance, must be made for occasional failure. In consideration of these weaknesses incident to gas-lamps, the suggestion of Mr. Simmance to make the 2-feet burner general cannot be recommended. In no town throughout the country has the 2-feet burner been adopted for general use.

The following are the subordinate criticisms directed against the management of incandescent lamps: Objection has been taken to the manner in which the lamps are fixed; but no information is given as to what is considered wrong. Mr. Mackay is quite at a loss as to what is meant by this. It appears, however, from another remark, that the charge of improper fixing is made against the German globe lamps, all of which were put up by the staff of the Gas Commissioners. Of the incandescent lanterns in use at the time of the reporter's visit, quite a number had also been fixed by Mr. Herring's men.

The aperture in the bottom of the lantern is condemned as being too large, and admitting a current of air injurious to the mantle. It is not clear whether this refers to the square lanterns or the German globes; but by a process of putting two and two together, it becomes evident that the German globe is meant. This lamp, when introduced, had too little air, and sweating followed; but this was largely remedied by a device of Mr. Herring's, whose staff had fitted up these lamps. A weakness, however, remained in the liability of the glass bottoms to be blown up in windy weather; but when this occurs it is at once reported and made good.

The aperture in the square lantern, which measures $\frac{3}{4}$ inch by $\frac{1}{4}$ inch, and not 1 inch in diameter, as suggested by the expert, left little to be desired; but the suggestion of Mr. Simmance that a washer should be put round the supply-pipe, though not considered appreciably necessary, has been given effect to. The following is to be found in the report: "In many cases the glass bottoms are wholly absent; in still more partially gone." This is a general charge; whereas it ought to have been strictly limited to the German globe lamps. In not a single instance has a bottom in the square lantern been blown out. In the middle of July, when Mr. Simmance was in Edinburgh, the following was the number and description of the incandescent lamps in operation: 2327 square lanterns, 270 German globes, and 43 cylindrical. Taking these 2327 square lanterns from the time of erection to the foregoing date, only four halves of the glass bottoms came to grief; and this was due to collision with the lamplighter's torch.

The reporter's finding on the stair lights, while very favourable, yet calls for remark. The testing has been on too limited a scale to warrant general inference; only 14 jets out of a total of 11,424 having been dealt with. Further, the governors are said to be adjusted to pass from $1\frac{1}{2}$ to 2 cubic feet of gas per hour, whereas they are restricted to $1\frac{1}{2}$ feet. In concluding his reply to Mr. Simmance, Mr. Mackay says he is disposed to ask: Why were the candle values determined by a standard No. 7 batswing, and by an argand burner consuming from 3 to $3\frac{1}{2}$ feet of gas per hour, instead of by the union jet burner prescribed by the Edinburgh Gas Act?

West's Stoking Machinery for Russia.

A contract has recently been placed with the West's Gas Improvement Company, Limited, by the German Continental Gas Company, for a complete installation of compressed air stoking machinery for their gas-works in Warsaw. The contract includes two sets of separate charging and drawing machines, two lines of coal breaking, elevating, and conveying machinery driven by gas-engines, and an air compressor, also gas-engine driven. The field of operation of West's stoking machinery has been widely extended during the past few years; apart from the United Kingdom, it is to be found working in Germany, Italy, Denmark, North America, South America, and Australia.

The Accounts of Municipal Authorities.

A Meeting of the Municipal Trading Committee of the London Chamber of Commerce was held on Friday, to consider the desirability of immediate representations being made to the Local Government Board in connection with the appointment of the Departmental Committee on Municipal Accounts noticed elsewhere. The matter had been referred to the Committee by the Council of the Chamber with a view to early action; and, after considering the recommendations of the Joint Select Committee on Municipal Trading, the composition of the Departmental Committee, and the terms of reference thereto, it was resolved: "That, having regard to the unanimous recommendations of the Joint Committee on Municipal Trading, 1903, it would appear to this Committee that the Departmental Committee recently appointed by the Local Government Board, in connection with municipal accounts, and consisting principally of Government and Municipal officials, does not conform to the recommendations of the Joint Committee, and that its decisions cannot command the confidence of the commercial community." It was reported that arrangements were being made for a conference of chambers of commerce, industrial associations, and municipal corporations, under the chairmanship of Mr. Felix Schuster, on the 5th of March, with special reference to the independent professional audit of municipal accounts and the standardization of such accounts; also that a large number of the bodies invited to the conference were in favour of the recommendations of the Joint Select Committee as regards both audit and standardization.

THE GASLIGHT AND COKE COMPANY'S ACCOUNTS.

[For the Half-Yearly Report, see p. 272.]

The accounts of the above-named Company for the six months ending Dec. 31, to be submitted with the Directors' report on Friday, consist of the usual statements, from which we take the following particulars.

The statement of capital (stock) sets forth that the total paid up is £9,466,500; added on conversion, £12,176,565—total amount authorized, £21,643,065. The statement of loan capital stands thus: Total paid up, £2,844,000; added on conversion, £1,479,975; unissued, £750,000—total amount authorized, £5,073,975.

The capital account shows receipts (with premiums, £1,586,807 11s. 9d.) to the amount of £27,533,882 11s. 9d. The expenditure is shown in the following items:—

Expenditure to June 30, 1905			£13,317,810 8 8
Expenditure during the half year to Dec. 31, 1905—viz.,			
Buildings and machinery in extension of works.	£13,538 18 7		
New and additional mains and service-pipes.	16,884 1 11		
Do. do. meters	30,520 16 7		
Do. do. stoves	27,532 2 1		
	£88,475 19 2		
Sale of surplus land	£18,909 16 8		
Sale and depreciation of plant	17,324 10 0		
	36,234 6 8		52,241 12 6
Total expenditure			£13,370,052 1 2
Nominal amount added on conversion			13,656,540 0 0
			£27,026,592 1 2
Deduct amount or capital redeemed under Company's Act of 1903			19,965 0 0
			£27,006,627 1 2
Balance of capital account			527,255 0 7
			£27,533,882 11 9

The following is the revenue account:—

Expenditure.

Dec. Half Year, 1904.		£ s. d.	£ s. d.
£607,403	Manufacture of Gas— Coal and oil into store	598,264 9 6	
14,724	Salaries of Engineers and other officers	15,046 10 0	
116,515	Wages, gas making £109,014 12s. 3d.	126,492 17 9	
17,687	,, sundries £17,478 5s. 6d.		
46,457	Purification, including £16,973 3s. 6d. for labour	41,633 19 7	
175,537	Repair and maintenance of works and plant, materials and labour, less received for old materials, £5025 9s. 1d	183,918 3 5	
	Distribution of Gas—		965,356 0 3
39,499	Salaries and wages of officers (including Rental Clerks)	41,261 11 5	
57,916	Repair and maintenance of mains and service-pipes	59,429 12 4	
26,697	Repair and renewal of meters	26,027 14 8	
34,930	Repair and renewal of stoves	36,483 10 10	
			163,202 9 3
17,941	Public lamps—Lighting and repairing	..	18,340 11 4
	Rents, rates, and taxes—		
5,878	Rents payable	5,842 12 6	
146,947	Rates and taxes	148,823 1 0	
			154,666 5 6
	Management—		
2,750	Directors' allowance	2,750 0 0	
219	Company's Auditors and Assistant	216 16 0	
	Salaries of General Manager, Secretary, Accountant, and clerks	7,515 14 4	
7,410	Collectors and Cashiers	24,555 9 9	
24,640	Stationery and printing	5,423 4 10	
8,133	General charges	3,526 10 0	
3,183			43,987 14 11
426	Parliamentary charges	..	1,628 15 11
1,514	Law charges	..	993 10 6
..	Charges *re* quinquennial re-valuation	..	1,388 4 7
4,386	Bad debts	..	4,936 18 11
500	Depreciation fund for Works on Leasehold Lands	..	500 0 0
19,389	Annuities, including contribution to officers' superannuation fund	..	23,172 14 10
703	Workmen's compensation account	..	647 18 4
	Public officers—		
743	Gas Referees and Official Auditor	848 17 9	
689	Public testing-stations	631 15 7	
			1,480 13 4
£1,382,814			1,380,302 7 8
513,070	Balance carried to net revenue account		503,847 16 8
£1,895,884			1,884,150 4 4

Receipts.

Dec. Half Year, 1904.		£ s. d.	£ s. d.
	Sale of gas— Per meter, at 2s. 11d. and 2s. 2d. per 1000		
£1,421,020	cubic feet	1,434,951 18 7	
68,193	Public lighting and under contracts	68,970 5 8	
			1,503,922 4 3
£1,489,213			
33,604	Rental of stoves	..	36,214 11 10
	Residual products—		
£233,873	Coke, less £36,474 1s. 10d. for labour, &c.	203,200 13 8	
12,938	Breeze, less £3115 14s. 9d. for ditto	14,233 3 8	
48,740	Tar and tar products	40,405 16 8	
72,643	Ammoniacal liquor and sulphate of ammonia	81,239 14 2	
			339,079 8 2
£368,194			
£4,586	Rents receivable		4,640 12 7
287	Transfer fees		293 7 6
£1,895,884			1,884,150 4 4

The balance applicable to the redemption fund and to dividend on the ordinary stock is £526,209 15s. 9d.; and the statement showing how it is proposed to appropriate it is shown next page.

Dec., 1904.			
£273,976	.. Net balance brought from last account	£217,408	4 6
3 9,567	.. Net revenue for the half year	308,801	11 3
£593,543		£526,209	15 9
10,000	.. Less contribution to redemption fund	10,000	0 0
(£4 8s. per cent.)	,, dividend on the ordinary stock—		
£335,350	.. £4 8s. per cent. per annum on £15,223,235 .	334,911	3 5
£248,193	.. Balance carried to next account	£181,298	12 4

The three statements relating to the reserve, insurance, and depreciation funds show that the balances on Dec. 31 were as follows: Reserve fund, £60,588 1s. 5d.; insurance fund, £86,405 8s. 8d.; and depreciation fund, £60,461 15s. 8d. The insurance fund had to bear in the past half year a sum of £40 8s. 6d., the value of plant destroyed by fires in the Company's district, and £2000, a further payment on account of claims in respect of the Southampton Row explosion.

The following statements relate to the working :—

Statement of Coals Used, &c.

Description of Coal.	In Store June 30, 1905.	Received During Half Year.	Carbonized During Half Year.	Used During Half Year.	In Store Dec. 31, 1905.
	Tons.	Tons.	Tons.	Tons.	Tons.
Common . . .	166,464	874,462	832,362	1,897	206,667
Cannel	13,580	..	*627	..	12,953
Total . . .	180,044	874,462	832,989	1,897	219,620

* In addition to this quantity of cannel, 8,228,142 gallons of oil and spirit were used during the half year.

Statement of Residual Products.

Description.	In Store June 30, 1905.	Made During Half Year.	Used During Half Year.	Sold During Half Year.	In Store Dec. 31, 1905.
Coke—tons	37,281	520,116	108,515	439,924	8,958
Breeze—tons	4,462	101,918	12,812	82,583	10,985
Tar—gallons	636,614	8,166,123	7,954,823	19,408	828,506
Ammoniacal liquor—butts	15,761	240,048	235,975	..	19,834

Statement of Gas Made, Sold, &c.

Quantity Made.	Quantity Sold.		Total Quantity Accounted for.	Number of Public Lamps.
	Public Lights and Under Contracts. (Estimated.)	Private Lights (per Meter).		
Thousands.	Thousands.	Thousands.	Thousands.	
*11,236,107	472,140	10,095,388	10,695,531	49,736
†11,058,033	473,534	9,969,317	10,583,104	48,990

* Including 2,562,315,000 cubic feet of "oil gas." † December half year, 1904.

The remaining statement is the balance-sheet, which gives the value of the stores in hand at the close of the half year as follows: Coal, £139,471; oil and petroleum spirit, £44,636; coke, £4484; tar and ammoniacal liquor and products, £86,518; and sundries, £231,175. The figures this time last year were: Coal, £168,648; oil and petroleum spirit, £43,687; coke, £22,024; tar and ammoniacal liquor and products, £81,314; and sundries, £234,095.

NORWICH TOWN COUNCIL AND SULPHUR RESTRICTIONS.

On the recommendation of the Law and Parliamentary Committee, the Norwich Town Council have authorized them to take such steps as they may deem necessary to oppose the Gas Companies (Removal of Sulphur Restrictions) Bill, if they think this course advisable. Mr. W. G. Stevens, in moving the adoption of the recommendation, explained that by the British Gaslight Company, Limited (Norwich), Act of 1896, the gas to be supplied by the Company within the limits of Norwich was to be of 15-candle quality, free from sulphuretted hydrogen, and not containing more than 25 grains of sulphur in any other form than sulphuretted hydrogen per 100 cubic feet, or a greater quantity of ammonia than 5 grains per 100 cubic feet. By the Bill now in question, the Company, in conjunction with others, were seeking to obtain powers relieving them from penalties by reason of the presence in gas of sulphur compounds other than sulphuretted hydrogen. It was believed that the Company had not the slightest intention of altering the present standard of gas in any form, but simply to prevent vexatious proceedings being taken against them, if the sulphur should rise above the limit. The question of relieving gas companies from the restrictions as to sulphur compounds had already been before Parliament; and a report by a Departmental Committee had been presented to both Houses. From this report, it would appear that the Committee were in favour of the removal of the restrictive obligations. The Bill had already been before the Law and Parliamentary Committee; and they gave instructions to the Town Clerk to obtain a report from Mr. Otto Hehner, a well-known gas expert. This report had been received; and it was in accordance with the findings of the Departmental Committee. The Town Clerk had also been in communication with certain other local authorities interested in the Bill, and especially Hull, which was the largest city involved, and whose case was on all-fours with that of Norwich. It was suggested that a conference of the authorities should be held in London at the end of the present month; but in regard to this nothing had yet been finally settled. The recommendation of the Law and Parliamentary Committee was to give them discretion as to what action they should take; but should they decide to oppose the Bill, they would have, before incurring the expense of petitioning against it, to again come to the Council.

THE ROYAL VISIT ILLUMINATIONS IN CALCUTTA.

Brilliant Display of Gas.

The accounts of the visit of the Prince and Princess of Wales to Calcutta which appeared in the London papers at the time, indicated in no uncertain way that the city was literally *en fete* on the occasion; but, of course, the details of the decorations and illuminations were necessarily not so ample as those contained in the local news sheets. From some of these, which have lately reached us through the courtesy of Mr. H. J. Luff, the Secretary of the Oriental Gas Company, we are able to extract a few particulars of interest to our readers.

On the 3rd inst., the Viceroy and Lady Minto gave a garden party, in the grounds of Government House, in honour of their Royal Highnesses, who in the evening drove through the city, following a route which had previously been marked out by the Prince of Wales. Everybody crowded into the streets, which shone with thousands of lights. "The hard diamond brilliance of the electric light, the warmer tones of gas, the soft glow of the *chirags* (or oil-lamps), the insistent glare of acetylene, and the flower-like beauty of the Chinese lanterns, were all blended," says the "Englishman," "in a brilliant confusion of light and colour." Before six o'clock the streets began to fill; and by the time twilight came on the buildings were sketched out mysteriously in light. In a second an electric device would flash out, and gas-jets flicker round buildings. The spectacle from the Outram Road as the Royal party started on their tour was magnificent. All the Chowringhee buildings were sumptuously lighted; and the impression gained of this fine thoroughfare was a most effective and striking one. The Grand, the Continental, and Bristol Hotels made fine displays, as was done at the Municipal Offices, which were not on the line of route. The first-named hotel, with all the shops underneath the huge verandah, was very attractive with its brilliant arches of coloured gas-lit domes overhead, and coloured lanterns and lamps tastefully arranged on the sides and under the arcade. But the finest effect was produced in the Municipal Office buildings, which, according to the "Indian Daily News," "danced in a framework of jewels," and, with the neighbouring Continental Hotel, "eclipsed everything in its vicinity." In Old Court House Street, the business men made an excellent show; Messrs. F. & C. Osler's premises being brilliantly illuminated by six arc lamps of 3000-candle power. In the Harrison Road, a four-storey building was not only lighted by electricity, gas, acetylene, Chinese lanterns, and coloured chandeliers, but had seven jets, one of which bore the words "God bless our Guests." From Harrison Road the procession passed into the Strand, the buildings in which were well lighted. From the Strand could be seen the Law Courts, the magnificently-lighted Town Hall, and the buildings flanking Government House. All three were perfectly dazzling. Gas was mainly used in the illumination of the Town Hall; and the effect was most artistic and complete. The Howrah Bridge had been illuminated with gas-jets, electric crowns, and stars, which showed off clearly in the dark back-ground. Leaving the Strand, the procession passed into Fairlie Place, where, on the East Indian Railway building, a brilliant effect was produced by a big locomotive outlined in electric and gas lights. In the neighbourhood of the river, the Volunteer Headquarters were handsomely illuminated with lanterns, &c.; while the letters "C.V.R." were prominently displayed. The procession next turned into Clive Street, again entered Dalhousie Square, and ended at the Government House. The writer in the "Englishman" says that when one had reached the gates after the dazzling experiences of a drive through the city so brilliantly lighted, it was almost with a sigh of relief.

In the course of the last letter, dated the 4th inst., received from the Company's Engineer (Mr. J. C. Watson) he said: "The Royal route last night was brilliantly lit up. The Gas Company had an important share in the arrangements, and the gas illuminations were in all cases a great success. With about a dozen electrical firms all touting for business, with many acetylene gasmakers, down to the humble *chirag*, or oil-lamp, we had our work to keep well to the front; and I may say with confidence that there never was a better show of gas lighting in Calcutta before. The electrical firms excelled themselves; and I only heard of one or two failures of their lights. We lighted the Town Hall, Municipal Offices, Great Eastern Hotel, Grand Hotel, "Belvedere" (the Lieut.-Governor's residence), the Young Men's Christian Association Buildings, and had gas devices on most of the Government and public buildings. To-day the effects of the oil *chirags* are plainly perceptible on all the places where they were used, and smoke and oil disfigure everything. In time to come, I think it likely the Government will adopt a more cleanly and economical form of lighting; and this means either gas or electricity."

We are pleased to be able to close this account of the share gas had in the illumination of Calcutta so memorable an occasion by recording that Mr. Watson and his principal Assistant (Mr. J. W. Mackay) had the honour of being presented to the Prince of Wales.

Pontefract Gas Purchase Bill.—At a public meeting called for the purpose of considering the proposals contained in the Pontefract Corporation Bill, the ratepayers (with only sixteen dissentients) approved of the clauses relating to the purchase of the gas-works. The Town Clerk read returns from 34 towns showing the reduction in prices and the surpluses earned by the municipalization of similar undertakings; and he pointed out that the estimated purchase price of £80,000 was altogether absurd, and that the shareholders were rather anxious to stick to their concern. Mr. J. Wilkinson, of Halifax, who is advising the Corporation, said the retorts were in a bad state; but he did not think the mains were. Every dilapidation would be taken into account by the arbitrator, and each one would be so much in the Corporation's favour. It was stated by one of the councillors present that 60 per cent. of the houses in the town were not supplied with gas.

WAGES OF GAS-WORKS LABOURERS AT HUDDERSFIELD.

A request having been made on behalf of the labourers employed at the Huddersfield Gas-Works for an increase in the rate of wages paid, information was sought respecting the remuneration offered in other towns. The Gas Committee then found that the rate per hour paid by them was fully equal to the average, and to the general rate of the district; and they therefore came to the conclusion that they could not accede to the demand for an increase. When this decision came before the Council for confirmation, Alderman Jessop explained that the question had been before the Committee for something like seven months; and the reason they had come to the present determination was that they felt it was in the interests of the workmen themselves. They discovered that they were paying even more than the average; and they had the names of several labourers on the books who were wanting work at less wages, if they cared to employ them. What would be the result if they went on increasing wages as they had done? It would mean that the little profit they thought they were making would be swallowed up by the extra cost of labour, and there would have to be a rate-in-aid. People had difficulty enough in paying the present rates, without this. Further, persons who did not burn gas would have to pay the rate-in-aid. At present, they were paying more for the labour required per million cubic feet of gas produced than any other town in the north of Yorkshire. The cost was £33, against £28 at Halifax. [Alderman Balmforth: And £42 at Bradford.] The application came from the Union; and it was made in a way that even the workmen themselves did not approve of. In fact, their men had nothing to do with the application; and he was not sure that they knew of it at all. It would be a reflection on the Gas Committee, who had tried to deal honestly and fairly with the question, if the minute was not adopted. Indeed, it would not only be a reflection, but an insult to the intelligence of the Committee.

In reply to questions, Alderman Jessop said the inquiries made of other towns showed that the wages for the particular class of labour referred to varied from 5d. to 6d. per hour; whereas at Huddersfield they were paying their labourers from 5½d. to 7d. per hour. An amendment was moved that the matter be referred back; but, on being put to the vote, only five members held up their hands in favour of it, and the recommendation was confirmed.

The authorities at Presteign, in Radnorshire, are offering a reward for information that will lead to the discovery of those responsible for what appears to have been an attempt to cause an explosion in the public hall. Just before the holding of a political meeting, an official of the Urban District Council visited the place, and detecting a considerable escape of gas made an examination. He then found that the pipes leading to the platform had been bored, apparently with a gimlet, in several places.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

The visit of the Western District of the Scottish Junior Gas Association to the Renfrew Corporation Gas-Works this afternoon was of unusual interest to the members, because to nearly all of them it was the first time they had seen the application of the simple, effective, and cheap method of handling coal and coke which has been adopted there. There was unanimity of opinion that for the taking in, the breaking, and the sending forward of coal to the retort-bench, as also for the quenching, taking away, sorting, and despatching of coke, the plant is unsurpassed; but when, in addition, it is applied to the placing of coal or coke in store, and the taking of it out again, it is far and away the easiest wrought and cheapest method which has yet been devised. In the latter respect, it has an undoubted and very tangible advantage over all other methods, even those which are to be found in the very largest works. This is a strong opinion; but it is endorsed by all who have seen the plant in action, and the result, in cost of working, bears it out. In other respects the works are worthy of the high praise which was given to them in the remarks that were made after the visit. The Town Council seem to have abundance of money to devote to gas-works and similar objects, and, in relation to the gas-works, it must be admitted that they have applied it in no grudging manner.

The Edinburgh and Leith Gas Commissioners' monthly meeting was held on Monday last, with Lord Provost Sir Robert Cranston in the chair. On the recommendation of the Works Committee, the Commissioners approved of the contracts for the extensions at the Granton Gas-Works, entered into with Messrs. Graham, Morton, and Co., Limited, being transferred to the new firm constituted by Mr. Maurice Graham, on condition of the new firm satisfying the Engineer and the Clerk as to their ability to complete the contracts, and giving proper security for their fulfilment. The Works Committee reported that the Engineer had expressed his opinion that it would be advisable that the Commissioners should now supply gas-cookers of one manufacture; and that they had instructed him to prepare a specification, so that it might be submitted to all manufacturers of cookers for their remarks, with the view of their being ultimately invited to tender for the make of cookers. This was approved of.

The Gas Committee of the Alloa Town Council have resolved to go in boldly for differential prices for gas. In July last, they fixed the price of gas for lighting purposes at 2s. 2d. per 1000 cubic feet, and at 2s. for industrial purposes. The latter rate has come to be considered too high, in view of the competition which has arisen with suction producer gas, and so a revision of rates has been made. For consumption under 400,000 cubic feet per annum, the charge is to remain at 2s.; but a graduated scale of prices has been fixed for larger consumptions. Thus, between 400,000 and 750,000 cubic feet per annum, the price is to be 1s. 10d.; between 750,000 and 1,250,000 cubic feet, 1s. 8d.; and above

CARBURETTED WATER-GAS APPARATUS

Merrifield—Westcott—Pearson Patents.

The Economical Gas Apparatus Construction Co., Ld.

W. H. PEARSON, Chairman.
W. H. PEARSON, Junr., Deputy-Chairman
J. T. WESTCOTT, Manager.
L. L. MERRIFIELD, M.Inst.M.E., Engineer.

London Offices: 19, ABINGDON STREET, WESTMINSTER, S.W.
American Offices: TORONTO. TELEGRAPHIC ADDRESS: "CARBURETED, LONDON."

CARBURETTED WATER-GAS ENGINEERS.

The above Company have erected since 1893, or are now erecting, their Universal Type of Carburetted Water-Gas Plant at the following Gas-Works:—

	Cub. Ft. Daily.		Cub. Ft. Daily.		Cub. Ft. Daily.
Blackburn	1,250,000	St. Catherines (Remodelled)	250,000	Tonbridge	300,000
Windsor St. Works, Birmingham	2,000,000	Kingston, Pa.	125,000	Stretford	500,000
Saltley Works, Birmingham	2,000,000	Peterborough, Ont.	250,000	Oldbury	300,000
Colchester	300,000	Wilkesbarre, Pa.	750,000	Todmorden	500,000
Birkenhead	2,250,000	St. Catherines (Second Cont.)	250,000	Saltley, Birmingham (Third Contract)	2,000,000
Swindon (New Swindon Gas Co.)	120,000	Buffalo, N.Y.	2,000,000	York (Second Contract)	750,000
Saltley, Birmingham (Second Contract)	2,000,000	Winnipeg, Man.	500,000	Rochester (Second Contract)	500,000
Windsor St., Birmingham (Second Contract)	2,000,000	Colchester (Second Contract)	300,000	Newport (Mon.)	250,000
Halifax	1,000,000	York	750,000	Tokio, Japan	1,000,000
Toronto	250,000	Rochester	500,000	Pernambuco, Brazil	125,000
Ottawa	250,000	Kingston, Ont.	300,000	Malton	150,000
Lindsay (Remodelled)	125,000	Crystal Palace District	2,000,000	Duluth, Minn. (Second Cont.)	300,000
Montreal	500,000	Duluth, Minn.	300,000	Brockville, Ont.	250,000
Toronto (Second Contract, Remodelled)	2,000,000	Caterham	150,000	Smethwick	500,000
Belleville	250,000	Leicester	2,000,000	Gravesend	300,000
Ottawa (Second Contract)	250,000	Enschede, Holland	150,000	Newport (Mon.) (Second Cont.)	250,000
Brantford (Remodelled)	200,000	Buenos Ayres (River Plate Co.)	700,000	Toronto (Third Contract)	750,000
		Burnley	1,500,000	Toronto (Fourth Contract)	1,000,000
		Kingston-on-Thames	1,750,000	Montreal, Ont. (Second Cont.)	1,800,000
		Accrington	500,000	Hamilton, Ont.	400,000

Leeds, 1,800,000 C. Ft. Leicester (Second Contract), 1,000,000 C. Ft. Newcastle-on-Tyne, 1,800,000 C. Ft.

And, in addition, 8,150,000 Cubic Feet daily; also Coal-Gas Plants at Nelson, B.C., Chatham, Berlin, Napanee, Owen Sound, Calgary, and Winnipeg.

1,250,000 cubic feet, 1s. 6d. These prices are to apply to gas used in large quantities for heating purposes, as well as for gas-engines. During the year 1904-5, the quantity of gas employed for industrial purposes was 10,461,900 cubic feet. The gas consumed by parties who will secure a reduction in price under the new rates amounted to 6,776,000 cubic feet, or 64·76 per cent. of all gas used for such purposes. The proposed new charges will involve a decrease in revenue to the Gas Department of £81. It is proposed that the new rates shall come into force after the January inspection of meters. Alloa is the first of the provincial towns in Scotland to take a definite step in selling gas at a low rate on a differential basis for the purpose of meeting the competition of suction producer gas. Glasgow has a rate—imposed last August—of 1s. 9d. per 1000 cubic feet, for power and manufacturing purposes. It has not been thought advisable to give a reduction to consumers of less than 400,000 cubic feet per annum, because it is felt that they are not likely to think of adopting suction producer gas, and that the competition would, in the first place, come only from large users. It was reported that the consumption of gas in the town and district for the six months ending November last had been 36,233,700 cubic feet, which was an increase of more than 3 million cubic feet over the corresponding period of 1904.

The community of Barrhead have rejected the proposal for the transfer of the gas undertaking to the Corporation. In October last, the Town Council, after giving a good deal of consideration to the subject, resolved to adopt the Burghs Gas Supply Acts, with a view to opening negotiations with the Gas Company. The resolution was confirmed by the Council in December, after the municipal election; but a remonstrance against the proposal, signed by more than twenty ratepayers, was lodged with the Town Clerk. A poll of the ratepayers was taken on Tuesday; and it showed a majority of 159 against the proposal.

The Corporation of Kilmarnock on Wednesday agreed, on the recommendation of the Watching and Lighting Committee, to greatly extend the system of incandescent gas lighting for the public lamps. The Gas Committee reported that, as the result of a recent canvass, 165 additional gas-cookers had been hired in the town.

The Aberdeen Corporation Gas Committee have had before them this week communications from three firms who manufacture gas appliances, with reference to the holding of an exhibition of their goods in the city; and a Sub-Committee was appointed to arrange with them for holding the exhibition and the giving of cookery demonstrations. It was resolved, with a view to the improvement of the gas supply in the northern suburbs, to lay enlarged mains, at a cost of nearly £600. Regarding a remit from the Council in connection with the amount of deposit requested from consumers when they desired their meters or indicators tested, they resolved to recommend that the charge should be 5s. on each occasion, and that it should be insisted upon when it was found that there was nothing wrong with the meters or indicators.

In the Perth Sheriff Court on Tuesday—before Sheriff-Substitute Sym—an action was brought at the instance of the Corporation of Perth against Wm. Wotherspoon, wine and spirit merchant, South Street and Watergate, Perth, in which £4 was sued for as due for the lighting of a public court to which, it is said, the defender has access. An agent for the defender disputed the account, and said his client was only responsible for a proportion of the charge for lighting. It was also denied that the defender had access to the court, and maintained that the account was partly irrecoverable, in respect that it extended over a period of seven years. The Town Clerk said the account was levied under section 105 of the Police Act of 1902, and the proprietor was assessed according to his rent. The Sheriff ordered proof.

CURRENT SALES OF GAS PRODUCTS.

Week ending Jan. 27.

There is very little change to report in the London market for tar products this week. Makers are well sold in most directions, and prices remain steady. Sulphate of ammonia is perhaps barely so strong; but the quotation is still £12 17s. 6d. per ton on Beckton terms to the end of April next.

Sulphate of Ammonia. LIVERPOOL, *Jan.* 27.

There has again been a quiet market, direct orders being scarce and supplies more abundant; and the tendency has been in favour of buyers. The closing quotations are consequently £12 7s. 6d. per ton f.o.b. Hull, £12 10s. to £12 11s. 3d. per ton f.o.b. Liverpool, and £12 12s. 6d. to £12 13s. 9d. per ton f.o.b. Leith. For delivery over near months £12 15s. per ton f.o.b. Leith is reported to have been paid, and there are further sellers at this price; but in face of the easier spot market, buyers have become indifferent about purchasing ahead at a premium. The Continent remains altogether uninterested; and Japan still keeps out of the market.

Nitrate of Soda.

This article, though quiet, is very firmly held, notwithstanding the large increase in January shipments. Spot prices are 10s. 10½d. to 11s. 1½d. per cwt., according to quality.

Tar Products. LONDON, *Jan.* 27.

Markets have been fairly steady during the past week; and though there has not been much actual business done, there has been a fair inquiry all round. Carbolic acid has been sold at 1s. 9½d for February-June at outports; while one of the largest manufacturers in Yorkshire reports business at 1s. 9¾d. over this period. The inquiry for crystals continues very good; but there is not much actual business

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MAXIM PATENT CARBURETTOR
FOR ENRICHING GAS IN BULK.
PREVENTS NAPHTHALENE DEPOSITS.
OVER 120 MAXIM PATENT CARBURETTORS HAVE NOW BEEN FIXED.
Among the Companies and Towns supplied are The Gaslight and Coke Company, Manchester, Exeter, Birmingham, Leeds, Rochdale, Bristol, Sheffield, Oldham, Dundee, Perth, Dunfermline, and many other Works, both large and small, where they have been working in some instances for the past Ten Years.
MORE GAS & SALEABLE COKE PER TON of COAL CARBONIZED is PRODUCED; SAVING CAPITAL, LABOUR, FUEL, WEAR & TEAR, &c.
THE ENRICHMENT IS INSTANTANEOUS AND PERMANENT.
The Carburettor is inexpensive, easily fixed, and entirely supersedes the use of Cannel.
Dealers in Benzol, Carburine, and all other Naphthas and Oils suitable for the Enrichment or Production of Gas.
For Prices and full Particulars, apply to
THE GAS LIGHTING IMPROVEMENT COMPANY, LIMITED,
7, BISHOPSGATE STREET WITHOUT, LONDON, E.C.

doing so far as the English manufacturers are concerned, as they have recently slightly raised their prices all round. A small quantity of 90 per cent. benzol has again been sold at 10¼d. for delivery all over the present year by London refiners; while it is reported that sales have been made in the North at slightly under 10d. for prompt delivery. In toluol, the price remains about 1s. per gallon; but manufacturers decline to offer forward even at this figure. The demand continues very good in solvent, especially for prompt delivery. So far as London is concerned makers appear very short of stock, and are not in a position to offer anything for prompt. Creosote is quiet; and the demand in London does not seem particularly strong just at present. Yorkshire manufacturers, however, are firm in their ideas, and report business at 1⅛d. for February delivery. In South Wales, the demand for pitch is still fairly good; but business is reported at a very low price by dealers. It is quite evident that the fuel trade is likely to be fairly brisk in Swansea and Cardiff for some little time to come; but so far as the Continent is concerned, there is an absence of demand just at the moment. The Belgian consumers appear well supplied, and do not seem at all anxious as to the immediate future.

The average values during the week were: Tar, 18s. to 22s. Pitch, London, 32s. to 32s. 6d.; east coast, 31s.; west coast, 30s. Benzol, 90 per cent., 10d. to 10¼d; 50-90 per cent., 10½d. to 10¾d. Toluol, 1s. Crude naphtha, 4d.; solvent naphtha, 1s. to 1s. 0½d.; heavy naphtha, 11½d. to 1s. 0½d. Creosote, London, 1⅛d.; North, 1⅛d. to 1⅛d. Heavy oils, 2¼d. Carbolic acid, 60 per cent., 1s. 9½d. to 1s. 9⅝d. Refined naphthalene, £5 to £9 10s.; salts, 23s. to 26s. Anthracene, "A" quality, 1½d. to 1⅝d.; "B" quality, unsaleable.

Sulphate of Ammonia.

There has been a fairly good demand during the past week, and prices have been well maintained. Beckton are still quoting £12 17s. 6d. for January-April; but they are not at all anxious to sell even at this figure. Business in Hull has been done for early shipment at £12 12s. 6d. for good makes; but manufacturers will only contract forward at a slight advance on this figure. In Leith, the market is very strong; and it is reported that some manufacturers have declined £12 15s. for prompt, which, however, may be taken as the value. In Liverpool, there has not been much actual business reported. Makers ask £12 12s. 6d. to £12 15s., according to quality and position.

Melbourne Metropolitan Gas Company.—The profits of the Company for the six months ending Dec. 31 were £56,500. A dividend of 5s. per share has been declared for the half year; £13,500 has been added to the reserve fund; and a balance of £2750 carried forward.

Berwick Water Scheme.—The Berwick Sanitary Authority last Tuesday held a special meeting to consider the proposal to carry out a joint water scheme for Berwick, Tweedmouth, and Spittal, at an estimated outlay of £20,000. Meetings of the ratepayers of Berwick and Tweedmouth had already declared against the scheme; and after a somewhat personal discussion, the Board rejected it by one vote.

COAL TRADE REPORTS.

Lancashire Coal Trade.

In house coal, trade this winter has never assumed any marked proportions, so far as sellers are concerned. The benefit has been all on the side of the consumer. Prices have been no higher than in the summer. A little more coal than on the average has been going out; but not sufficient to warrant a general increase in prices. Furnace coal still meets with a good demand. Slack, however, is the most remunerative, and stands first on the list of inquiries. On new and renewed contracts much better prices are being secured. The demand for coke has abated somewhat; but there has been no easement in the current rates. On the contrary, no old contracts are being renewed except at an advance in price. For gas coal and cannel, the better part of the winter is over. With lengthening days, the demand slackens. Coal for shipping has met with an increased demand during the past week. There has been more activity at the Canal tips—in fact, we know one local Colliery Company who had to reject a large order, as they could not meet it. Quotations at the pits were: Best house coal 13s. 6d. to 14s., secondary 12s. to 13s., common 9s. to 10s., steam and forge 8s. to 9s., best engine fuel 7s. 6d. to 8s. 6d., best slack 6s. 6d. to 7s. 6d., medium 6s. to 7s., washed slack 7s. to 7s. 6d., common 5s. to 6s. Coal for shipping is 9s. 6d. to 10s. 6d.; and furnace coke, delivered locally, is from 15s. to 22s.

Northern Coal Trade.

There is a good demand for coal, but it is not so pressing as it was; the German demand being less. Still, there have been sales at good prices, which keep up the values of some kinds of coal unequally. Best Northumbrian steams are from 10s. to 11s. per ton f.o.b., second-class steams are 9s. 6d., and steam smalls are firm and rather scarce at 6s. Work at the collieries is now tolerably full, with a normal output; so that the demand is well met, except where there are contracts running that are heavier than usual. In the gas coal trade, the demand is tolerably full; but it has now passed its maximum, though best gas coal is still rather scarce. Prices of Durham gas coal range from 8s. 6d. to nearly 10s. per ton f.o.b.—according to quality. The contracts are now allotted for the Copenhagen gas supply. There is the usual variation in prices when the freight is included; but the general belief is that about 9s. 9d. will be the f.o.b. value of the best Durham gas coal. There are now other contracts for gas coal for the season's shipments in treaty; and the price will be better defined soon—meantime it seems to tend upwards. In coke, the market is very firm; and this has its influence on gas coke, more especially as the production is less. On the Newcastle Exchange, gas coke has been quoted at 11s. per ton f.o.b.; but there is much variation in the values.

Scotch Coal Trade.

There is still great activity in the market, as the shipping returns show. Purchasers have at last conceded that forward prices must go

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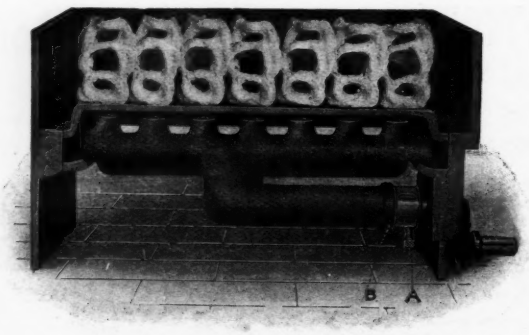

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up. It is announced that a large volume of business has been placed for forward delivery, at prices ranging from 6d. to 1s. per ton over the prices at this time last year. The current prices quoted are: Main 7s. 9d. to 8s. per ton f.o.b. Glasgow, ell 8s. 9d. to 9s. 6d., and splint 9s. 9d. to 10s. The shipments for the week amounted to 226,413 tons—an increase of 24,848 tons upon the preceding week, and 16,902 tons upon the same week of last year. For the year to date, the total shipments have been 521,671 tons—an increase of 79,782 tons upon the corresponding period of 1905.

Screw-Threads for Gas-Pipes.

Referring to the remarks of the "Ironmonger" on the above subject quoted in the "JOURNAL" last week (p. 243), Mr. A. W. Hutton, of Messrs. John Russell and Co., Limited, of Walsall, the representative of the English section of the tube trade on the Engineering Standards Committee, has written to our contemporary as follows: "The final report on pipe-threads was issued in April of last year, and the standards fixed by that report for sizes up to 2¼ inches are identical with the Whitworth sizes to which the trade has hitherto worked, with the one exception of the 1⅛-inch size, which is not much used. Above 2¼ inches some alterations have been made; but the general adoption of these depends upon the provision of gauges by which to test and maintain a correct adherence to the standards fixed. A set of such gauges will be provided and deposited at the National Physical Laboratory, and a duplicate set is to be provided for the use of the trade. A Sub-Committee have in hand the question of these gauges; and although the investigations necessary to decide as to the best design, material, and method of manufacture have caused considerable delay, they will be available in due course. It is, however, necessary to point out that a set of standard gauges has been in existence for many years, and that unless tube makers will take the necessary precautions to work to these gauges, the unsatisfactory state of affairs to which you refer will continue." In a note to this letter, the Editor expresses his pleasure in giving publicity to the statements contained therein, from which it would appear that gauges may presently be available for all tube manufacturers. He remarks that if the Committee arrange for the production of these male and female gauges, and the trade then specify tubes and fittings to be true to them, and refuse to accept delivery if they are not, the present muddle would cease automatically.

A Reservoir Accident at Sedgeley.—Last week a somewhat serious accident occurred in connection with a reservoir under construction at Sedgeley by the South Staffordshire Water-Works Company. Eight men fell a distance of nearly 20 feet owing to a scaffolding giving way; and two of them were badly injured. The accident is attributed to the slipping of the ropes of the scaffolding, in consequence of their being saturated with rain.

Water Supply to Tenement Houses.

The Public Health Committee of the Holborn Borough Council reported on Monday last week that in March, 1905, they instructed the Medical Officer of Health to take steps, wherever necessary, for the serving of notices with a view to securing the provision of a proper and sufficient supply of water for the tenants of every floor of all tenement houses in the borough. A number of notices had from time to time been served since, and in the majority of instances the owners had complied with the requirements. In some cases, however, the Committee had been satisfied if one additional water supply was provided about midway between the basement and the top floor. In two cases it had been found necessary to take legal proceedings; and in both orders were made by the Magistrate for the provision of a proper and sufficient supply. The Committee were informed that similar proceedings which had recently been instituted by the Councils of other boroughs at the Marylebone and Paddington Police Courts had been unsuccessful. In the Paddington case, which was dismissed with costs, the Magistrate held that the words of the section of the Public Health (London) Act, 1891, "proper and sufficient supply" referred to the sources of the supply, and not to the provision of taps within the house. The matter having been brought before the Parliamentary Committee of the London County Council, that Committee stated that they were advised that it was by no means clear that the present law was not sufficient to meet the case. Having regard, however, to the adverse decision above referred to, the Committee of the Holborn Council were of opinion that it was desirable that the existing law should be amended, with a view to enabling local authorities to enforce the provision of an adequate and accessible supply of water to floors in tenement houses; and they had decided (subject to the usual sanction) to urge the London County Council to take the necessary steps to obtain an amendment of the law.

Gas-Workers' Dispute at Blackburn.—During the past fortnight a dispute has been in progress at the Addison Street (No. 2) Gas-Works Blackburn. Some machinery breaking down, hand labour had to be resorted to; and a dispute occurred over a reduced staff of two per shift of eight hours. The men came out on strike; and when other men were asked to do the work, they declined, and increased the number on strike from 36 to 65. The matter was considered by the Gas Committee, who agreed that the men who first came out on strike should be allowed to start at once. A Sub-Committee considered the question on Thursday, and asked the men what they were prepared to accept as a minimum, as the present number of retorts is a reduction compared with what was working before. The men replied that they would be willing to do the work with nine men per shift, or 27 men in all; and in the event of a machine breaking down, they would endeavour to continue the work without any extra staff. Nothing definite was, however, arrived at.

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Suggested Purchase of the Rossendale Union Gas-Works.—The Haslingden Corporation have declined an offer from Rawtenstall to join that borough, along with Bacup, in a purchase of the Rossendale Union Gas-Works.

Suffocation by Gas.—Last Tuesday, a woman named Woodward, in the employ of a Mumbles draper, was found dead in a room, with the gas-jet turned full on. A travelling rug had been stuffed round the bottom of the door; while on the table was found the address of her friends at West Bromwich. Deceased, who had only been a few months in her situation, had been unwell for some time.

Rejection of the Croydon Water Bill.—At the close of the report of the proceedings at the special meeting of the Croydon Town Council on the 16th inst. which appeared in the "JOURNAL" last week, it was stated that the ratepayers were to be polled on the subject of the Water Bill, the promotion of which had not been sanctioned at the statutory meeting. The poll was taken on Friday, when the numbers were: For the Bill, 1351; against, 6450—majority against 5099.

A Gas Poisoning Case at Croydon.—An inquiry was held at Croydon last week into the circumstances attending the death of William Bravery, a labourer. Deceased, who slept in a house alone, was found dead in bed; and there was a strong smell of gas in the room, though the door was slightly open. The tap of the gas-burner, which was turned on, was stated to be very loose. Dr. Jameson said that death was due to gas poisoning; and a verdict to this effect was returned.

The Vagaries of the Electric Light.—An unfortunate incident marked the opening ceremony at the new buildings of the Working Men's College in Crowndale Road, St. Pancras, on Saturday, the 20th inst. A social gathering had taken place early in the evening, and while preparations were being made for holding a meeting in the lecture hall (named after the founder of the college, the Rev. F. D. Maurice), the electric light failed, and the place was thrown into darkness. Candles were procured, and by their feeble light the proceedings were commenced by the Principal (Professor Dicey). Sir W. Anson, who was to formally open the buildings, was delivering his address when the defect (a fused wire) was remedied and the light was restored.

Manchester Water Supply.—The average daily amount of water supplied by the Manchester Corporation during 1905 was 35,219,578 gallons, compared with 32,994,581 gallons in 1904. The second pipe from Thirlmere began delivering water at the Prestwich reservoirs in November, 1904; and since then the daily average supplied from Thirlmere has been 16,694,391 gallons, compared with 9,665,482 gallons in the previous twelve months. The greatest consumption was in July, when the average daily quantity supplied was 38,086,637 gallons; and the lowest in April, when it was 32,629,514 gallons. The maximum amount drawn from Longdendale was in July, the daily supply being 21,361,839 gallons; and the maximum from Thirlmere was in January, the daily quantity being 20,426,594 gallons.

Competitive Public Lighting in the City.—The City of London Electric Lighting Company have offered to carry out, at their own cost, a demonstration of an improved system of electric lighting in certain streets of the City—viz., Newgate Street, Holborn, New Bridge Street, and Farringdon Street—in competition with the incandescent gas lighting now in use in the City.

Leicester Water Supply.—All immediate anxiety with regard to the position of the Leicester water supply is at an end, as, in consequence of the recent heavy rains, the reservoirs are now about half filled. The latest official return of the Water Committee shows that since Jan. 1 the stock in the three reservoirs has increased by 368 million gallons. The deficit is now 714 million gallons, as against 721 millions at the same date last year.

Gas v. Electricity at Pontypridd.—At a recent meeting of the Electricity Committee of the Pontypridd Urban District Council, a letter was read from the Consulting Engineer to the effect that, as copper and lead had gone up in price, it was advisable for the Council to place at once the contract for laying the cables for the arc lighting of the Rhondda electric tramway route. Mr. D. Williams said he did not see the advantage of lighting the route with arc lamps, as the cost was much greater than that of gas. He preferred waiting to ascertain what the expense of the present lamps would be before undertaking extensions. He thought there should be a twelve months' actual trial. In view of the Committee's experience up to the present time, he would move that the cables should not be laid. He believed it was the experience of the tradespeople that gas was the cheapest illuminant. Mr. T. B. Evans seconded the motion; saying it was clear to every member that arc lighting was dearer than gas. It was eventually decided to defer laying the cables pending the presentation of reports by the Electric and Gas Engineers as to the cost of their respective systems of lighting.

Lighting of the Hertford Shire Hall.—At the quarterly meeting of the Hertfordshire County Council, Mr. Christie, on the recommendation of the Building Sub-Committee for the Hertford Division, proposed that the suggestion to light the Shire Hall with electric light be approved, and that the work of wiring the building, and fitting up the necessary lamps, be carried out at a cost of £330, provided the Corporation of Hertford would contribute £65 and the Electric Light Company £100. He said these undertakings had been given. It would be remembered that previously the Committee had recommended the adoption of the Keith system of incandescent lighting; but since then the Electric Light Company had offered to pay £100 towards the cost of the installation of electricity. It was only fair to say that the Hertford Gas Company had sent him—and no doubt other members of the County Council—a circular once more putting forward their system, and contending that it was the more economical method, both as regards original outlay and annual cost. He was not an expert; but he thought the general feeling of the Sub-Committee was that the electric light was preferable, principally on account of its great cleanliness. The proposal was agreed to by a large majority.

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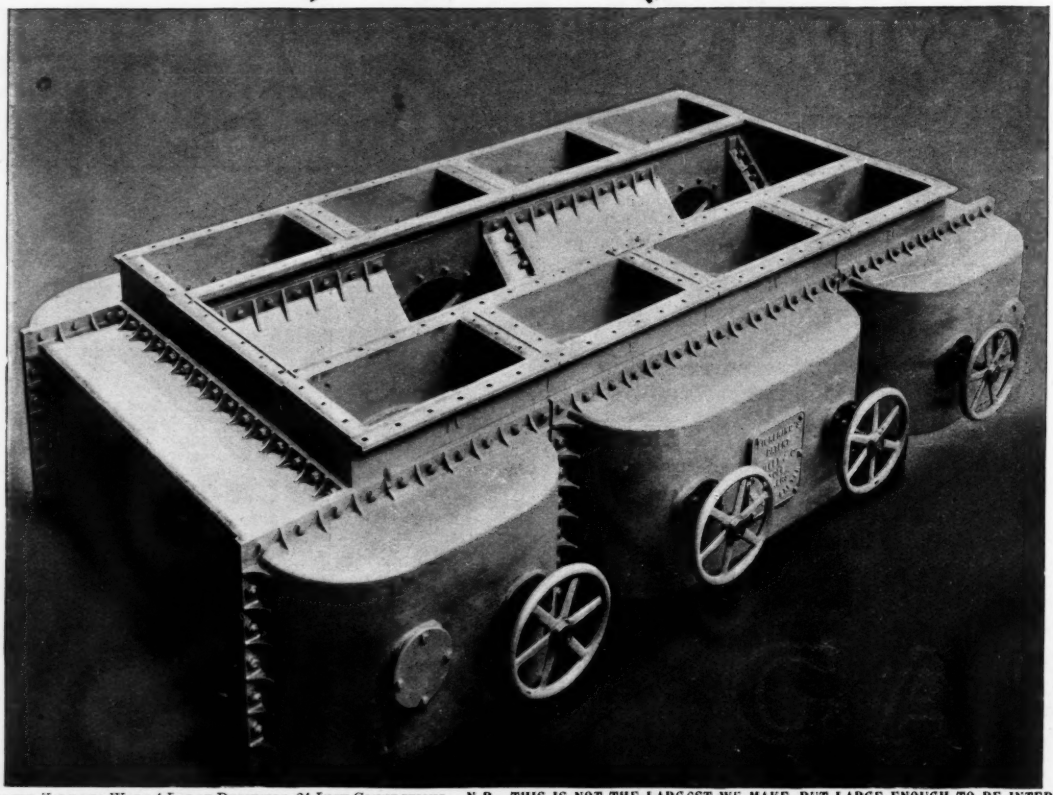

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AGENTS FOR SCOTLAND: D. M. NELSON & CO., 53, WATERLOO STREET, GLASGOW.

Eastbourne Gas Company's Extension.—The Eastbourne Gas Company are extending their mains to the neighbouring village of Willingdon, which will shortly be in the comfortable position of having a supply of both gas and electricity. The cost of the extension is estimated at £6000.

Water-Main Burst at Manchester.—Considerable obstruction was caused in Hyde Road, Manchester, last Thursday, by the bursting of a 36-inch water-main. The force of the explosion blew out a large portion of the pipe, and a great volume of water poured down the road towards the city. A telephonic message was sent to the Water Department at the Town Hall; but all the valves in the immediate vicinity were by that time submerged, and the nearest point at which the inflow could be checked was nearly a mile away. Some time, therefore, elapsed before the supply was stopped. The pipe was one of those supplying the city from the Audenshaw reservoir. It was laid in 1881, and was previously tested with a pressure far above the 60 lbs. to which it would be subject at the time of the accident. The only reason that can be assigned for the mishap is that the main contained a hidden flaw. On examination, it was discovered that the dislodged portion of the pipe measured nearly 7 feet in length.

The Leeds Water Committee are still considering the question of afforestation in the Washburn Valley; and a further report upon the matter is expected shortly to be made by a Sub-Committee.

The Richmond Gas Stove and Meter Company, Limited, have received an order from the Maidstone Gas Company for 30 of their "Monarch" gas steam-radiators, for heating the Town Hall and the Corn Exchange in the town.

A Local Government Board inquiry has been held into an application by the Accrington District Gas and Water Board for a loan of £9750, of which £3000 was for gas and the remainder for water. A considerable portion of the water loan is required for filter-beds.

The Directors of the Weardale and Consett Water Company recommend the payment of a dividend at the rate of 6½ per cent. per annum for the half year ending December. This makes, with the interim distribution at the rate of 5 per cent. paid in July last, a dividend of 5¾ per cent. for the past year.

Under the title of Frederick Miller and Co., Limited, a Company has been formed with a capital of £2000, in £1 shares, to carry on the business of manufacturers of fire-clay goods, fire-bricks, electric light, bell, and gas fittings, electric light and power machinery and appliances, &c., and to acquire the business carried on at Shepherd's Bush, W., as Frederick Miller and Co.

It is reported that the Weardale Steel, Coal, and Coke Company, Limited, are about to lay down at their Tudhoe Works, South Durham, an extensive installation of bye-product coke-ovens, with plant for the recovery of tar and sulphate of ammonia. A contract has been let to the Koppers Coke-Oven Company, of Sheffield; and no fewer than 120 ovens, each fitted with a separate regenerator, are to be provided.

We have received from Mr. S. Edgecumbe Rogers "The Water Supply of Villages and Small Towns," by Mr. H. C. H. Shenton. The little book is a reprint of some articles which the author, who is a member of the Society of Engineers and the holder of one of their gold medals, contributed to the "Local Government Journal." He does not go deeply into the subject, but merely presents some practical notes in a handy and portable form.

A paragraph appeared in last week's issue mentioning that some large Livesey washers are now in process of manufacture, "to be used in connection with apparatus for dealing with naphthalene troubles;" and that two of the washers were for the Croydon Gas Company. We are asked to point out that all the washers there referred to are not to be used for naphthalene troubles, as those for Croydon "are required for treating coal gas in the usual way."

WANTED, FOR SALE, CONTRACT, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

Situations Vacant.

LONDON REPRESENTATIVE. No. 4551.
WORKING FOREMAN. Godalming Gas Company.
CHIEF DRAUGHTSMAN. No. 4543.
TRAVELLERS (COAL AND CANNEL). No. 4544.
CHEMICAL ASSISTANT. No. 4546.
DRAUGHTSMAN. No. 4547.
SLOT COLLECTOR, &c. No. 4545.

Situations Wanted.

INSPECTOR. No. 4537.
ASSISTANT WORKS OR COMMERCIAL MANAGER. No. 4540.
ASSISTANT IN WORKS TO LEARN BUSINESS. No. 4548.
STOKER. No. 4549.
ASSISTANT. No. 4550.

Plant (Second-Hand) for Sale.

ENGINE AND EXHAUSTER, CONDENSERS, MOUTHPIECES, DIP, &c, PIPES, HYDRAULIC MAIN, BOILERS. Newton Ayr Gas Company.
STATION METER. Redditch Gas Company.

Company Meetings.

SOUTH METROPOLITAN GAS COMPANY. Cannon Street Hotel. Feb. 14. Two o'clock.
COMMERCIAL GAS COMPANY. Cannon Street Hotel. Feb. 15. Twelve o'clock.
SOUTH SUBURBAN GAS COMPANY. Albion Tavern. Feb. 23. Three o'clock.

Partnership.

INCANDESCENT MANTLE BUSINESS. No. 4552.

Stocks and Shares.

CROYDON GAS COMPANY. Feb. 1.
HARROW AND STANMORE GAS COMPANY. Feb. 6.
SOUTHEND WATER COMPANY. Feb. 6.
SUNDERLAND AND SOUTH SHIELDS WATER COMPANY. Feb. 22.

TENDERS FOR

Boilers.

LEICESTER GAS DEPARTMENT. Tenders by Feb. 10.

Conveying and Elevating Machinery, &c.

STOCKPORT GAS DEPARTMENT. Tenders by Feb. 14.

Fire-Clay Goods.

RHYMNEY AND ABER VALLEYS GAS AND WATER COMPANY.
STOCKPORT GAS DEPARTMENT. Tenders by Feb. 14.
WELLS GAS DEPARTMENT. Tenders by Feb. 3.

Gasholders.

RHYMNEY AND ABER VALLEYS GAS AND WATER COMPANY.

Purifiers.

RHYMNEY AND ABER VALLEYS GAS AND WATER COMPANY.

Retort Benches, Ironwork, &c.

RHYMNEY AND ABER VALLEYS GAS AND WATER COMPANY.
STOCKPORT GAS DEPARTMENT. Tenders by Feb. 14.
WELLS GAS DEPARTMENT. Tenders by Feb. 3.

Retort Mouthpieces, Bench Fittings, &c.

SHEFFIELD GAS COMPANY. Tenders by Feb. 6.

Sulphate of Ammonia.

ARBROATH GAS DEPARTMENT.

GAS COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 272.

Issue.	Share.	When ex. Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.				£ s. d.
590,000	10	Oct. 13	10½	Alliance & Dublin 10 p.c.	21—22	..	4 15 5
160,000	10	,,	7½	Do. 7 p.c.	14⅜—15½	..	4 16 9
200,000	5	Nov. 15	7	Bombay, Ltd.. . . .	6⅞—7¼	..	4 16 7
40,000	5	,,	7	Do. New, £4 paid	5—5⅛	..	5 1 10
50,000	10	Aug. 31	14	Bourne- } 10 p.c. . .	29—30	..	4 13 4
51,810	10	,,	7	mouth Gas } B 7 p.c. .	17—18	..	3 17 9
53,200	10	,,	6	and Water } Pref. 6 p.c.	15¼—16½	..	3 12 9
380,000	Stk.	Aug. 16	12½	Brentford Consolidated	260—265	..	4 14 4
300,000	,,	,,	9¾	Do. New . . .	197—202	..	4 14 1
50,000	,,	,,	5	Do. 5 p.c. Pref. .	125—130	..	3 16 11
206,250	,,	Dec. 14	4	Do. 4 p.c. Deb. .	101—104	..	3 16 11
220,000	Stk.	Sept. 15	11¼	Brighton & Hove Orig.	223—228	+1	4 18 9
246,320	,,	,,	8¼	Do. A. Ord. Stk. .	162—167	..	4 18 10
460,000	20	Sept. 28	10	British	42⅞—43½	..	4 11 11
100,000	Stk.	Aug. 16	6	Bromley, Ord. 5 p.c. .	121—124	..	4 16 9
165,700	,,	,,	4½	Do. do. 3½ p.c. .	91—94	..	4 15 9
500,000	10	Oct. 13	7	Buenos Ayres (New) Ltd.	12¼—12⅝	..	5 9 10
250,000	Stk.	Dec. 29	4	Do. 4 p.c. Deb. .	95—97	..	4 2 6
150,000	20	July 13	8¼	Cagliari, Ltd.	24—26	..	6 6 11
100,000	10	Sept. 28	10	Cape Town & Dis., Ltd.	17—17½	..	5 14 3
100,000	10	Oct. 27	4½	Do. 4½ p.c Pref.. .	10—10½	..	4 5 9
50,000	50	Nov. 2	6	Do. 6 p.c. 1st Mort.	52—54	..	5 11 1
50,000	Stk.	Dec. 29	4½	Do. 4½ p.c. Deb. Stk.	100—102	..	4 8 3
1,434,680	Stk.	Aug. 31	5⅛	Commercial 4 p.c Stk. .	117—119	..	4 7 4
560,000	,,	,,	5	Do. 3½ p.c. do. .	113—115	..	4 6 11
475,000	,,	Dec. 14	3	Do. 3 p.c. Deb. Stk.	84—86	..	3 9 9
800,000	Stk.	,,	6½	Continental Union, Ltd.	128—133	+1	4 17 9
200,000	,,	,,	7	Do. 7 p.c Pref.	143—148	..	4 14 7
424,070	Stk.	—	5½	Derby Con. Stk. . . .	125—127	..	4 6 8
55,000	,,	—	4	Do. Deb. Stk. . . .	108—110	..	3 12 9
486,090	10	Jan. 25	11	European, Ltd. . . .	22—23*	+⅛	4 15 8
354,060	10	,,	11	Do. £7 10s. paid	16—17*	+¼	4 17 0
15,223,235	Stk.	Aug. 16	4⅛	Gas- } 4 p.c. Ord. . .	101½—102½	—⅛	4 5 10
2,600,000	,,	,,	3½	light } 3½ p.c. max. .	89—91	..	3 16 11
3,799,735	,,	,,	4	and } 4 p.c. Con. Pref.	110—112	..	3 11 5
4,193,975	,,	Dec. 14	3	Coke } 3 p.c. Con. Deb.	87—89	..	3 7 5
258,740	Stk.	Sept. 15	5	Hastings & St. L. 3½ p.c.	101—103	..	4 17 1
82,500	,,	,,	6½	Do. do. 5 p.c.	123—126	..	5 3 2
70,000	10	Oct. 13	11	Hongkong & China, Ltd.	20—21	..	5 4 9
3,800,000	Stk.	Nov. 15	10	Imperial Continental .	235—237	+3	4 4 5
473,600	Stk.	Aug. 16	3½	Do. 3½ p.c. Deb. Red.	96—98	..	3 11 5
175,242	Stk.	Aug. 31	6	Lea Bridge Ord. 5 p.c. .	123—128	..	4 13 9
561,000	Stk.	Aug. 16	10	Liverpool United A . .	237—239	..	4 3 8
718,100	Stk.	Aug. 16	7	Liverpool United B . .	170—172	−2	4 1 5
306,083	,,	Dec. 29	4	L'rpool Unit'd Deb. Stk.	109—111	..	3 12 1
75,000	5	Dec. 14	5	Malta & Medn., Ltd. .	4⅛—4⅜	..	5 5 3
560,000	100	Oct. 2	5	Met. of } 5 p.c. Deb..	103—105	..	4 15 3
250,000	100	,,	4½	Melbourne } 4½ p.c. Deb.	103—105	..	4 5 9
541,920	20	Nov. 15	3⅜	Monte Video, Ltd. . .	11½—12½	..	5 12 0
1,565,892	Stk.	July 29	4⅝	Newc'tle & G'tesh'd Con.	107—109	..	4 4 10
406,625	Stk.	Dec. 29	3½	Do. 3½ p.c. Deb.	98—100	..	3 10 0
15,000	10	Aug. 31	10	North Middlesex 10 p.c.	18½—19½	..	5 2 7
52,940	10	,,	7	Do. 7 p.c.	13—14	..	5 0 0
300,000	Stk.	Nov. 30	8	Oriental, Ltd. . . .	148—151	..	5 6 0
600,000	5	Sept. 14	7	Ottoman, Ltd. . . .	6—6½	..	5 7 8
398,490	5	Apl. 28	6	Primitiva Ord. . . .	7—7½	..	4 0 0
796,980	5	Jan. 25	5	Do. 5 p.c. Pref. .	5¼—5¼*	..	4 10 11
488,900	100	Dec. 1	4	Do. 4 p.c. Deb. .	97—99	..	4 0 10
851,070	10	Oct. 13	7	River Plate Ord. . . .	12¾—13¼	..	5 5 8
300,000	Stk.	Dec. 29	4	Do. 4 p.c. Deb. .	97—99	+2	4 0 10
250,000	10	Sept. 28	7	San Paulo, Ltd. . . .	13—13⅜	..	5 3 8
70,000	50	Jan. 2	5	Do. 5 p.c. Deb. .	50—52	..	4 16 2
135,000	Stk.	Sept. 14	10	Sheffield A	244—246	..	4 1 4
209,984	,,	,,	10	Do. B	244—246	..	4 1 4
523,498	,,	,,	10	Do. C	244—246	..	4 1 4
126,106	Stk.	Aug. 31	5½	Shrewsbury Ord. 5 p.c.	110—120	..	4 11 8
70,000	10	Sept. 28	10	South African	15½—16½	..	6 1 3
6,250,000	Stk.	Aug. 16	5½	South Met., 4 p.c. Ord.	130—132	..	4 3 4
1,895,445	,,	Jan. 11	3	Do. 3 p.c. Deb.	86—88	..	3 8 2
575,000	Stk.	Aug. 16	5½	S'th Suburb'n Ord. 5 p.c.	123—126	..	4 7 4
60,000	,,	,,	5	Do. 5 p.c. Pref. . .	127—132	..	3 15 9
112,533	,,	Jan. 11	5	Do. 5 p.c. Deb. Stk.	130—135	..	3 14 1
502,310	Stk.	Nov. 15	5	Southampton Ord. . .	109—112	..	4 9 3
120,000	Stk.	Aug. 31	6¼	Tottenham } A 5 p.c. .	125—128	..	4 17 8
363,020	,,	,,	4¾	and } B 3½ p.c. .	99—102	..	4 13 2
125,000	,,	Dec. 14	4	Edmonton } 4 p.c. Deb.	105—107	..	3 14 9
182,380	10	Dec. 29	8	Tuscan, Ltd.	9½—10	..	8 0 0
149,900	10	Jan. 2	5	Do. 5 p.c. Deb. Red.	99—101	..	4 19 0
30,000	Stk.	Aug. 16	7¾	Wands- } A 5 p.c. . .	—	..	—
255,636	,,	,,	6¼	worth } B 3½ p.c. . .	137—140	..	4 9 3
60,000	,,	,,	5¼	and } C 3½ p.c. . .	113—116	..	4 13 6
57,564	,,	Dec. 29	3	Putney } 3 p.c. Deb. Stk.	80—83	..	3 12 3
745,872	,,	Aug. 16	5	West Ham 5 p.c. Ord. .	105—107	..	4 13 6
185,000	,,	,,	5	Do. 5 p.c. Pref. . .	123—126	..	3 19 4
193,300	,,	Dec. 29	4	Do. 4 p.c. Deb. Stk.	102—107	..	3 14 9

Prices marked * are "Ex. div."

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O'NEILL'S OXIDE
For GAS PURIFICATION.
LARGEST SALE OF ANY OXIDE.

SPENT OXIDE PURCHASED IN ANY DISTRICT.

GAS PURIFICATION & CHEMICAL CO., LD.
PALMERSTON HOUSE,
OLD BROAD STREET, LONDON, E.C.

WINKELMANN'S
"VOLCANIC" FIRE CEMENT.
Resists 4500° Fahr. Best for GAS-WORKS.
ANDREW STEPHENSON, 182, Palmerston House, Old Broad Street, London, E.C. "Volcanism, London."

AMMONIACAL Liquor wanted.
BROTHERTON AND CO., LTD., Ammonia Distillers.
Works: BIRMINGHAM, GLASGOW, LEEDS, LIVERPOOL, AND WAKEFIELD.

"NUGEPE" GAS PLANT CEMENT.
JOHN E. WILLIAMS AND CO.,
LOWER MOSS LANE,
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For all Joints in connection with Oil-Gas Plant and Sulphate Plant.
For all Gas Joints.
For all Tar Joints.
For all Ammonia Joints.

BROTHERTON & CO., LIMITED.
Offices: Commercial Buildings, LEEDS.
Correspondence invited.

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OVER 2000 INSTALLATIONS IN DAILY USE.
SEE illustrated advertisement in next week's issue.
JAMES KEITH AND BLACKMAN CO., LTD., 27, Farringdon Avenue, LONDON, E.C.

SPENT OXIDE.
THE South Metropolitan Gas Company are always open to receive OFFERS of SPENT OXIDE.
Chief Office: 709, Old Kent Road, London, S.E.
Telegrams: "METROGAS, LONDON."

GAS TAR wanted.
BROTHERTON AND CO., LTD., Tar Distillers.
Works: BIRMINGHAM, GLASGOW, LEEDS, LIVERPOOL, AND WAKEFIELD.

GLASS SHADES of every description, for all kinds of Interior **GAS LIGHTING.**
Illustrated sheets on application.
JOHN WALSH WALSH,
SOHO AND VESTA GLASS WORKS, BIRMINGHAM.
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National Telephone: No. 63.
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BROTHERTON AND CO., LTD., Chemical Manufacturers.
Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

GAZINE—A radical Solvent and Preventative of Naphthalene deposits, which has been used for many years on the Continent for the cleaning of Mains and Services, and is now being adopted in England. It is also used for the Enrichment of Gas, and has an Illuminating Value of double that of 90 per cent. Benzol.
Supplied by C. BOURNE, 120, Manor House Road, NEWCASTLE-ON-TYNE.

J. & J. BRADDOCK (Branch of Meters Limited), Globe Meter Works, OLDHAM, and 54 & 47, Westminster Bridge Road, LONDON, S.E.
WET AND DRY GAS-METERS, PREPAYMENT METERS, STATION METERS, AND GOVERNORS.
REPAIRS RECEIVE PROMPT ATTENTION.
Telephones: 254 Oldham, and 2412 HOP, London.
Telegrams:—
"BRADDOCK, OLDHAM," and "METRIQUE, LONDON."

DUTCH OXIDE OF IRON.

SPENT OXIDE PURCHASED IN ANY DISTRICT

THE First Dutch Bogore Co., Ltd., HOLLAND.
General Manager (for England and Wales)—
CHARLES E. FRY, LEAMINGTON.
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J. B. MACDERMOTT, 11, Bothwell St., GLASGOW.

GAS OILS.
MEADE-KING, ROBINSON, & CO.
Represent the Strongest Independent Refineries in America; also Petroleum Spirit for Gas Enrichment. 8, EXCHANGE STREET, MANCHESTER, and 11, OLD HALL STREET, LIVERPOOL.

SULPHATE OF AMMONIA
SATURATORS and all LEAD and TIMBER WORK in Connection with Sulphate Plants.
We guarantee promptness, with efficiency for Repairs.
JOSEPH TAYLOR AND CO., CENTRAL PLUMBING WORKS, BOLTON.
Telegrams: SATURATORS, BOLTON. Telephone 0848.

TO WATER AND GAS COMPANIES REQUIRING CAPITAL.
THE Water and Gas Debenture Share
Investment Trust, Limited, of 37, High Street, Tunbridge Wells, are prepared to Invest £10,000 Capital in above, and also to Underwrite Progressive Water and Gas Companies' issues.

HYDRATED OXIDE OF IRON.
PREPARED from Pure Iron.
Twice as Rich as Bog Ore.
Gives no Back Pressure.
The Cheapest in the Market.
Can be Exchanged for Spent Oxide.
READ HOLLIDAY AND SONS, LTD., HUDDERSFIELD.

TAR AND LIQUOR WANTED.
Best Prices paid.
DENT AND CO.,
Ouse Chemical Works, SELBY.

SITUATION Wanted in Works making about a Million cubic feet, or in larger works, where young Son could assist and learn business.
Address No. 4548, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

GENTLEMAN (Aged 24) desires position as ASSISTANT WORKS or COMMERCIAL MANAGER. Practical and Technical Training. Thoroughly conversant with the making of Gas Plant and Gas Manufacture. Good Organizer and Commercial ability. References.
Address No. 4540, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

ASSISTANT, now engaged with Gas Company of 50 Million output, desires to Improve his position by moving to larger Works. In present Situation 3½ years. City and Guilds Certificate. Good Experience, including Gasholder Construction, Erection of other Manufacturing and Distributing Apparatus.
Address No. 4550, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

CHIEF Draughtsman required immediately by a Firm manufacturing Gasholders, Gas-Works Plant, Chemical Plant, and Constructional Steel Work of all descriptions. Must be capable of making his own Calculations of Strength, &c., and of Designing new work. Fine opening for a clever, capable man, with good powers of Organization and Control over his Staff.
All Applications will be considered in strict confidence, and should state Age, Salary expected, &c., and when at liberty.
Apply, by letter, to No. 4543, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

OXIDE OF IRON.
(NATURAL.)

BALE & CHURCH will be pleased to send Quotations and Samples on application.
SPENT OXIDE PURCHASED.
BALE'S FIRE CEMENT for all Retort and Furnace work.
PAINT for Gasholders, Purifiers, &c.
5, CROOKED LANE, LONDON, E.C.

SULPHURIC ACID.

SPECIALLY prepared for the Manufacture of SULPHATE OF AMMONIA.
SPENCER, CHAPMAN, & MESSEL, LTD.
(with which is amalgamated WM. PEARCE & SONS, LTD.),
36, Mark Lane, LONDON, E.C. Works: SILVERTOWN.
Telegrams: "HYDROCHLORIC, LONDON."
Telephone 341, AVENUE.

YOUNG Man requires Situation as STOKER; well up in Carbonizing in small Works. Trustworthy. Good Testimonials.
Address, No. 4549, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

INSPECTOR seeks Re-Engagement. Experienced in Prepayment and Automatic Work, every description of Lighting (both interior and exterior), Public Lighting, Main and Service Laying, Management of Show-Rooms, &c. References.
Address No. 4537, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

LONDON Representative—Wanted, a Gentleman with Good Connection among leading Consulting Engineers, Foreign Merchants, and Buyers to REPRESENT a First-Class Firm of Gas and General Constructional Engineers who are on Admiralty and other Government Lists. One with Practical Knowledge, able to Advise Clients and discuss technical points preferred. Applications will be treated with strict confidence, and should state Age and Salary required.
Apply, by letter, in first instance, to No. 4551, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

DRAUGHTSMAN Wanted by leading Firm of Gas Engineers in Lancashire. Preference given to one capable of detailing Gas-Works Apparatus.
Apply, stating Experience and Salary required, to No. 4547, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, Two or Three Travellers to sell Coal and Cannel. Must be well known to Gas Managers. State District known in, and full Particulars as to previous employment. Payment by Salary or Commission, or both.
Address No. 4544, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

CHEMICAL Assistant required (for London) to TAKE CHARGE of Chemical Apparatus Department in Factory, make up Test Solutions, Calibrate Measures of Capacity, and Gas Pressure. General knowledge of Photometry desirable.
Apply, by letter, to No. 4546, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, by a large Provincial Gas and Water Company, a smart young man of good address and education, as SLOT COLLECTOR, and to ASSIST, when required, in Office. Good Constitution and Steady Habits. Wages 26s. per week, rising in two years to 30s.
Application, in own handwriting, with *copies* of Three recent Testimonials, to No. 4545, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WORKING Foreman required by the Godalming Gas Company. Must thoroughly understand everything connected with the Manufacture and Distribution of Gas, competent to Superintend men, capable of Main Laying and General Fitting, and of preparing Estimates for Fitting Work. Wages from 42s. per week, with House, Gas, and Fuel.
Apply, stating Experience, Age, and with not more than Three Testimonials, to the SECRETARY of the GAS COMPANY, Godalming, SURREY.

WANTED, Gas Meters, Obsolete, Wets or Drys, for Cash.
ROSSE WORKS, Leeds Road, BRADFORD.

ROBERT DEMPSTER & SONS, Ltd., Contractors for Complete CARBONIZING PLANTS and every description of GAS APPARATUS and ELEVATING and CONVEYING PLANT, ROSE MOUNT IRON-WORKS, ELLAND.

PARTNERSHIP—An Incandescent Mantle Manufacturer, with Fully-Equipped Factory, Plant, &c., capable of turning out 15,000 weekly, wants Partner. Capital £300. Every investigation.
Apply, by letter, to No. 4552, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED to Purchase, Gas Carbon delivered at nearest Station to Gas-Works, in quantities of not less than Four Tons.
State Price to No. 4512, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

REDDITCH GAS COMPANY.

STATION Meter for Sale. Handsome design. Perfect Condition. Capacity, 11,200 feet per hour. Cheap to immediate purchaser.
ALBERT E. LAYTON,
Manager.

GAS PLANT for Sale—I can always offer NEW and SECOND-HAND GAS APPARATUS, including Retorts and Fittings, Condensers, Exhausters. Scrubbers, Washers, Purifiers, Gasholders, Tanks, Valves, Connections, &c. Also a few COMPLETE WORKS. Compare Prices and Particulars before ordering elsewhere.
J. F. BLAKELEY, Gas Engineer, Thornhill, DEWSBURY.

SECOND-HAND Plant for Sale by the Newton Ayr Gas Company—
1 STEAM ENGINE and EXHAUSTER, 10,000 cubic feet per hour.
1 Set of 8-inch CONDENSERS—Twelve double rows of 8-inch Pipes.
38 RETORT MOUTHPIECES, 22 in. by 15 in. by 6 in, faucets, with duplicate doors and Screwed Cross-heads for each.
38 DIP, BRIDGE, and STAND PIPES.
9 9 ft. 6 in. lengths of D-Steel HYDRAULIC MAIN, 20 in. by 18 in. each, 9 ft. 6 in. in length, made for 7-inch dips.
1 CORNISH BOILER, 13 ft. by 5 ft., with Mountings complete.
2 Egg-end BOILERS, 15 ft. by 4 ft.
Will be Sold Cheap. Particulars from the Manager, J. GIBB.

SULPHATE OF AMMONIA.

THE Arbroath Gas Corporation invite TENDERS for 90 to 100 Tons of SULPHATE OF AMMONIA. A copy of Schedule will be sent on Application to Mr. ALEXR. C. YOUNG, Manager, Gas-Works, ARBROATH.

COUNTY BOROUGH OF STOCKPORT.
(GAS DEPARTMENT.)

THE Gas Committee invite Tenders for the Supply and Erection of INCLINED-RETORT BENCHES, together with Sixteen Furnaces and Settings complete with all Ironwork, Coal-Hoppers, Coal Elevating and Conveying Plant, and Hot-Coke Conveying and Storing Plant.
Plans, Specifications, and full Particulars can be obtained on application to the Engineer, Mr. S. Meunier, Portwood Gas-Works, Stockport, on payment of One Guinea, which will be returned on receipt of a *bonâ-fide* Tender.
Tenders, sealed and endorsed "Inclined-Retort Benches," must be delivered to the Town Clerk's Office, Stockport, addressed to the Chairman of the Gas Committee, on or before the 14th of February next ensuing.
No Tender will be accepted without satisfactory proof that the Firm Tendering pays the Trade Union rate of wages, and observes the Trade Union number of hours as are usually paid and observed in the district where the goods are made or produced.
By order,
ROBERT HYDE,
Town Clerk.
Stockport, Jan. 26, 1906.

TO ENGINEERS AND IRONFOUNDERS.

THE Directors of the Sheffield United Gaslight Company invite TENDERS for the following WORK at their Effingham Street Station.
TENDER No. 1.
For the Supply and Delivery only of 136 RETORT MOUTHPIECES, 22 in. by 16 in. ⊂-shaped, with Self-Sealing Lids.
TENDER No. 2.
For the Supply and Fixing of BUCKSTAYS, LONGITUDINAL TIES, ROLLED STEEL JOISTS, &c., for Stage Floor.
TENDER No. 3.
For the Supply and Erection of HYDRAULIC MAINS, ASCENSION PIPES, and RETORT IRONWORK generally for Eight Beds of Through Retorts.
Drawings may be seen and quantities obtained upon application to the Company's Engineer, Mr. J. W. Morrison, Commercial Street, on and after Thursday, Jan. 25.
The Directors do not bind themselves to accept the lowest or any Tender.
Sealed Tenders (endorsed) must be delivered by post to the undersigned not later than the first post on Tuesday, Feb. 6, 1906.
HANBURY THOMAS,
General Manager and Secretary.
Commercial Street, Sheffield,
Jan. 17, 1906.

RHYMNEY AND ABER VALLEYS GAS AND WATER COMPANY.

PERSONS desirous of Tendering for RETORT BUILDING, PURIFIERS, and GAS-HOLDERS required by the above Company are requested to send their names and addresses to the undersigned.
ALBERT R. CAWLEY,
General Manager.
Caerphilly,
via Cardiff.

CORPORATION OF LEICESTER.
LANCASHIRE BOILERS.

THE Gas and Electric Lighting Com- mittee of the above Corporation are prepared to receive TENDERS for the Supply and Erection, on Foundations provided, of Three LANCASHIRE BOILERS, 22 ft. by 7 ft., at their Aylestone Road Works.
Specification and Form of Tender may be obtained on Application to the Engineer, and on payment of £5, which amount will be returned upon receipt of a *bonâ-fide* Tender.
Tenders, addressed to Mr. Councillor Edwards, Chairman, and endorsed "Tender for Boilers," to be delivered at these Offices not later than Eleven o'clock a.m. on Saturday, Feb. 10, 1906.
The Committee do not bind themselves to accept the lowest or any Tender.
ALFRED COLSON, M.Inst.C.E., M.Inst.E.E.,
Engineer and Manager.
Offices: Millstone Lane,
Leicester, Jan. 29, 1906.

RETORT-BENCH, &c.

THE Wells Urban District Council invite TENDERS for the Erection, at their Gas-Works, Wells, Norfolk, of a RETORT-BENCH and Shallow Type REGENERATIVE-SETTING of Three Retorts, ⊂-shaped, 21 in. by 15 in. by 9 ft. in length. The Contract to include Excavations, Fire-Clay, and other Materials, Producer Ironwork, Flooring, Sight Boxes, Plugs, &c. (but not Bench and Retort Mountings).
Tendering parties must state quantity of Gas guaranteed per Mouthpiece per day and Fuel Consumption in ordinary working (Yorkshire Silkstone Screened Coal carbonized), also when they will undertake to have the work completed.
Particulars may be obtained of the Council's Engineer, Mr. E. G. Smithard, King's Lynn.
Tenders, addressed to the undersigned, to be lodged on or before Feb. 3, 1906.
The Council do not bind themselves to accept the lowest or any Tender.
By order,
E. B. LOYNES,
Clerk.
Wells, Norfolk,
Jan. 17, 1906.

SOUTH METROPOLITAN GAS COMPANY.

NOTICE is Hereby Given, that the ORDINARY HALF-YEARLY GENERAL MEETING of the Proprietors of this Company will be held at the Cannon Street Hotel, in the City of London, on Wednesday, the 14th day of February next, at Two o'clock in the afternoon precisely, to receive the Directors' Report and the Accounts of the Company for the Half Year ended the 31st of December last; to declare a Dividend for the same period; and to Elect Two Directors and One Auditor in the place of those retiring by rotation.
The TRANSFER BOOKS WILL BE CLOSED from the 31st day of January, until after the Meeting.
Notice is Hereby Also Given, that at 2.30 o'clock in the afternoon, or so soon thereafter as the business of the Ordinary Meeting shall have been concluded, an EXTRAORDINARY MEETING of the Proprietors will be held for the purpose of considering the Provisions of the Bill now before Parliament, intituled "A Bill to empower the South Metropolitan Gas Company to purchase lands, and for other purposes." At such Meeting the said Bill will be submitted for the consideration and approval of the Proprietors.
By order,
FRANK BUSH,
Secretary.
Offices: 709, Old Kent Road,
London, S.E., Jan. 20, 1906.

SOUTH SUBURBAN GAS COMPANY.

NOTICE is Hereby Given, that the ORDINARY HALF-YEARLY GENERAL MEETING of the Proprietors of this Company will be held at the Albion Tavern, Aldersgate Street, London, E.C., on Friday, the 23rd day of February, 1906, at Three o'clock in the afternoon precisely, to receive the Report of the Directors and Statement of Accounts for the Half Year ended the 31st of December last, to declare a Dividend for the same period, to elect Two Directors and One Auditor in the place of those retiring by rotation, and for General purposes.
Notice is Hereby Given, that an EXTRAORDINARY MEETING of the Proprietors of the South Suburban Gas Company will be held at the Albion Tavern, Aldersgate Street, London, E.C., on Friday, the 23rd day of February next, at 3.30 o'clock in the afternoon, or as soon thereafter as the business of the Ordinary Meeting of the Proprietors shall be concluded, for the purpose of considering the provisions of the Bill now before Parliament, intituled "A Bill to make further provisions with respect to the gas supplied by the South Suburban Gas Company, and the price to be charged therefor and for other purposes."
At such Meeting the said Bill will be submitted for the consideration and approval of the Proprietors.
Dated this 9th day of February, 1906.
The TRANSFER BOOKS WILL BE CLOSED from the 9th day of February until after the Meeting.
By order of the Board,
CHARLES M. OHREN,
Secretary.
Offices and Works:
Lower Sydenham, S.E.,
Jan. 26, 1906.

COMMERCIAL GAS COMPANY.

NOTICE is Hereby Given, that an ORDINARY MEETING of the Commercial Gas Company will be holden at the Cannon Street Hotel, in the City of London, on Thursday, the 15th of February, 1906, at Twelve o'clock at noon, to receive the Directors' Report and the Accounts of the Company for the Half Year ended the 31st of December, 1905, to declare a Dividend, to elect Directors and an Auditor in the place of those retiring.
The STOCK TRANSFER BOOKS WILL BE CLOSED from the 2nd to the 15th of February next, both days inclusive, and the Dividends will be paid on the 1st of March next to the holders of Stock registered at the date of the closing.
By order of the Board,
H. D. ELLIS,
Secretary.
Offices: Stepney,
Jan. 25, 1906.

ISSUES BY AUCTION OF GAS AND WATER STOCKS AND SHARES.

MR. ALFRED RICHARDS begs to notify that his ISSUES by AUCTION under PARLIAMENTARY POWERS of STOCKS and SHARES in LONDON, SUBURBAN, and PROVINCIAL GAS and WATER COMPANIES take place PERIODICALLY at the Mart, TOKENHOUSE YARD, E.C.
Terms for Issuing such Capital, and also for including Gas and Water Stocks and Shares belonging to Private Owners in these Periodical Sales, can be obtained on application at MR. ALFRED RICHARDS' OFFICES, 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the
HARROW AND STANMORE GAS COMPANY
NEW ISSUE OF 500 £10 "C" SHARES.

MR. ALFRED RICHARDS will Sell the ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, Feb. 6, at Two o'clock, in Lots.
Particulars of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

SOUTHEND WATER-WORKS COMPANY.
100 £10 ADDITIONAL ORDINARY 7 PER CENT. MAXIMUM DIVIDEND SHARES.

MR. ALFRED RICHARDS will Sell the ABOVE BY AUCTION, at the Mart, London, E.C., on Tuesday, Feb. 6, at Two o'clock, in Lots.
Particulars of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

By Order of the Directors of the
CROYDON GAS COMPANY.
SALE OF £5000 "C" STOCK,
the last Dividend on which was at the rate of 10¾ per cent.

MESSRS. HOOKER & WEBB have re- ceived Instructions to SELL BY AUCTION, at the Greyhound Hotel, Croydon, on Thursday, the 1st of February, at Six o'clock precisely,
£5000 CONSOLIDATED "C" ORDINARY STOCK
of the
CROYDON GAS COMPANY,
the last Dividend on which was paid at the rate of 10¾ per cent.; but the Dividend payable for the half year ending the 31st of December, 1907, under the operations of the Croydon Gas Company's Act, 1904, will have to be the same as that paid on the "B" Stock, which for some years past has been at the rate of 11½ per cent. per annum. The sale, therefore, offers an unusually good opportunity for a safe and improving investment.
Particulars and Conditions of Sale may be had at the OFFICES OF THE COMPANY, and of the AUCTIONEERS, 4, High Street, CROYDON. Telephone 122 Croydon.

SUNDERLAND AND SOUTH SHIELDS WATER COMPANY.
IMPORTANT SALE OF WATER STOCK.

TO BE SOLD by Auction, in the Long Room of the Queen's Hotel, Fawcett Street, Sunderland, on Thursday, Feb. 22, 1906, at Two o'clock in the Afternoon prompt,
MR. ATKINSON GIBSON, AUCTIONEER,
£20,000
(Nominal) of Additional ORDINARY CAPITAL STOCK (Maximum Dividend Five per cent.) authorized to be created and issued under the powers contained in the Sunderland and South Shields Water Act, 1891.
The above Stock will be entitled to Dividend from the 1st day of January, 1906, and be registered in the name of the Purchaser free of charge.
A deposit of 10 per cent. will be required at the time of Sale; the remainder to be paid on or before the 1st day of March, 1906.

HEATHCOTE GAS COAL.

Rich in Illuminating Power and yield of Gas Above the Average in Weight and Quality of Coke.

Maintains a High Standard in Residuals.

THE GRASSMOOR CO., LD.,
CHESTERFIELD.

Now Ready. Price 5s. 6d. Post Free.

REPORTS OF DISTRICT GAS ASSOCIATIONS FOR 1905.

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Price 10s. 6d., Green Cloth, Gilt Lettered.
VOL. XCII.
OF THE
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GREEN CLOTH CASES for Binding the Quarterly Volumes of the "JOURNAL," Gilt Lettered, Price 2s.

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MIRFIELD GAS COAL
UNEQUALLED.
Sperm Value 878·85 lbs. per Ton.

Please apply for Prices, Analyses, and Reports, to the
MIRFIELD (GAS COAL) COLLIERIES
RAVENSTHORPE, NEAR DEWSBURY.
LONDON: 22, Park Village East, N.W.

NEWBATTLE CANNEL.
Highest Results in Gas, & Excellent Coke.
QUOTATIONS ON APPLICATION TO
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JAMES OAKES & CO.,
ALFRETON IRON-WORKS, DERBYSHIRE,
AND
Wenlock Iron Wharf, 21 & 22, Wharf Road, CITY ROAD, LONDON, N.
Manufacture and keep in Stock at their Works (also large Stock in London)
PIPES and CONNECTIONS, 1½ to 48 inches in diameter, and make and erect to order RETORTS, PURIFIERS, and TANKS, with or without planed joints, COLUMNS, GIRDERS, SPECIAL CASTINGS, &c., required by Gas, Water, Railway, Telegraph, Chemical, Colliery, and other Companies.
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CALORIMETER
for determining the calorific value of gases
IS MADE BY
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Makers of Scientific Apparatus,
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Conveyor and Elevator Specialists,
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Make known your wants for Conveyors and Elevators to GILBERT LITTLE, the Pioneer Specialist; he will supply them.

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Best Gas Coal and Cannel, giving High Illuminating Power, Large Yield per ton, and reasonable in Price.
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Operated Entirely by One Handle
Class A lifts 25 ft.
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OUR AIM IS QUALITY.
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TO BUY THE PUREST IS THE BEST AND MOST SATISFACTORY.
ALL PAINTS GUARANTEED TO BE GROUND IN PURE LINSEED OIL.
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Patent Automatic Machinery
FOR
DRAWING AND CHARGING GAS-RETORTS.
Full Particulars may be obtained from the Sole Makers,
SIR WILLIAM ARROL & CO., Limited,
GLASGOW.
[See Illustrated Advertisement, Jan. 2, p. 8.]

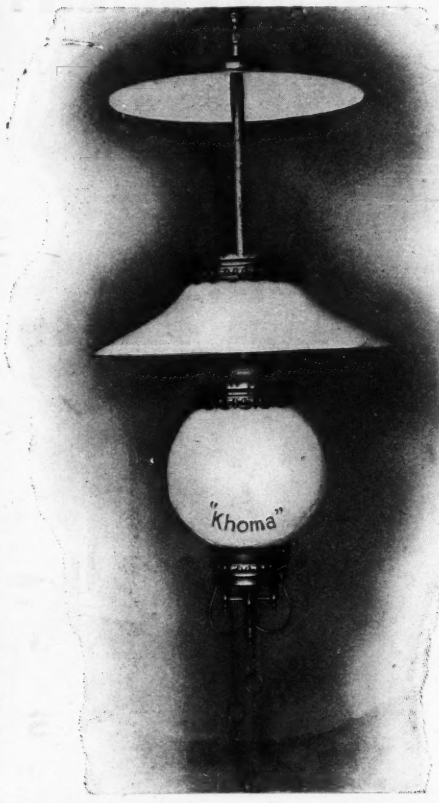
THE "KHOMA" INCANDESCENT GAS ARC LAMP.

For Interior Lighting.

The only Lamp on the Market in which the Gas is properly heated and expanded before it reaches the Burner.

Imitations have not this Super-Heating Chamber for the Gas.

There are some people who have doubts as to the value of heating the gas used for incandescent lighting preliminary to combustion. The question may be simply settled, each one for himself, by comparative photometrical tests. The idea has received the support of many careful scientific investigators. Among the latest to carry their researches into this particular field are Drs. F. Haber and F. Richardt, whose valuable dissertation on "The Bunsen Flame, and Methods for the Chemical Determination of Flame Temperatures" was noticed at some length in the "JOURNAL OF GAS LIGHTING" for the 31st of January. Being towards the end of that article, it may have escaped the attention of some readers that there these investigators said: "The temperature of combustion of a gaseous mixture may be raised by a preliminary warming of the gas at the expense of the combustion products (as in regenerative furnaces), but not at the expense of the burning gas itself—that is to say, by subsequent, but not simultaneous, warming."



English Manufacture.

Our Super-Heating Chamber and Trap for Condensation or Impurities of the Gas are built on scientific and mechanica principles.

If it has not this Super-Heating Chamber, it is not a "Khoma," and not efficient.

Patents—9747, '04, and 11,148, '05.

STRONGLY AND SUBSTANTIALLY MADE THROUGHOUT.

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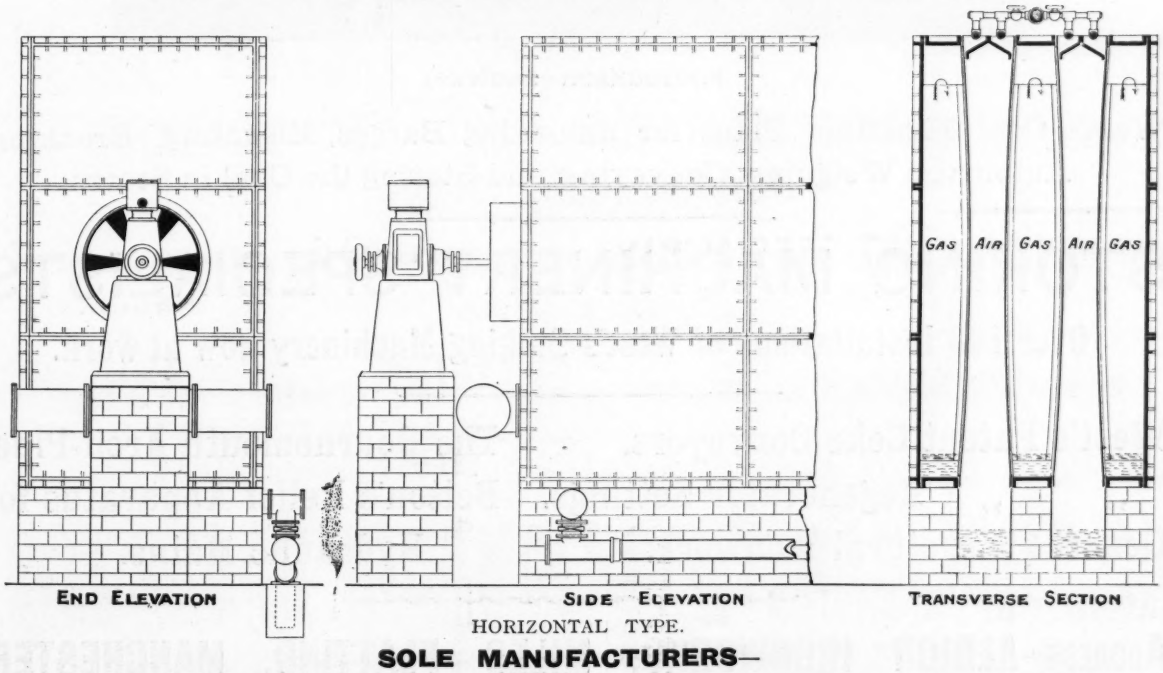
FOUR BURNERS—500-CANDLE POWER.

BROWNE & CHANDLER'S PATENT
Vaporizing Condensers.

In these Air Condensers a greatly increased efficiency is secured by Internal Evaporation of a comparatively trifling quantity of water, with or without Fan draught.



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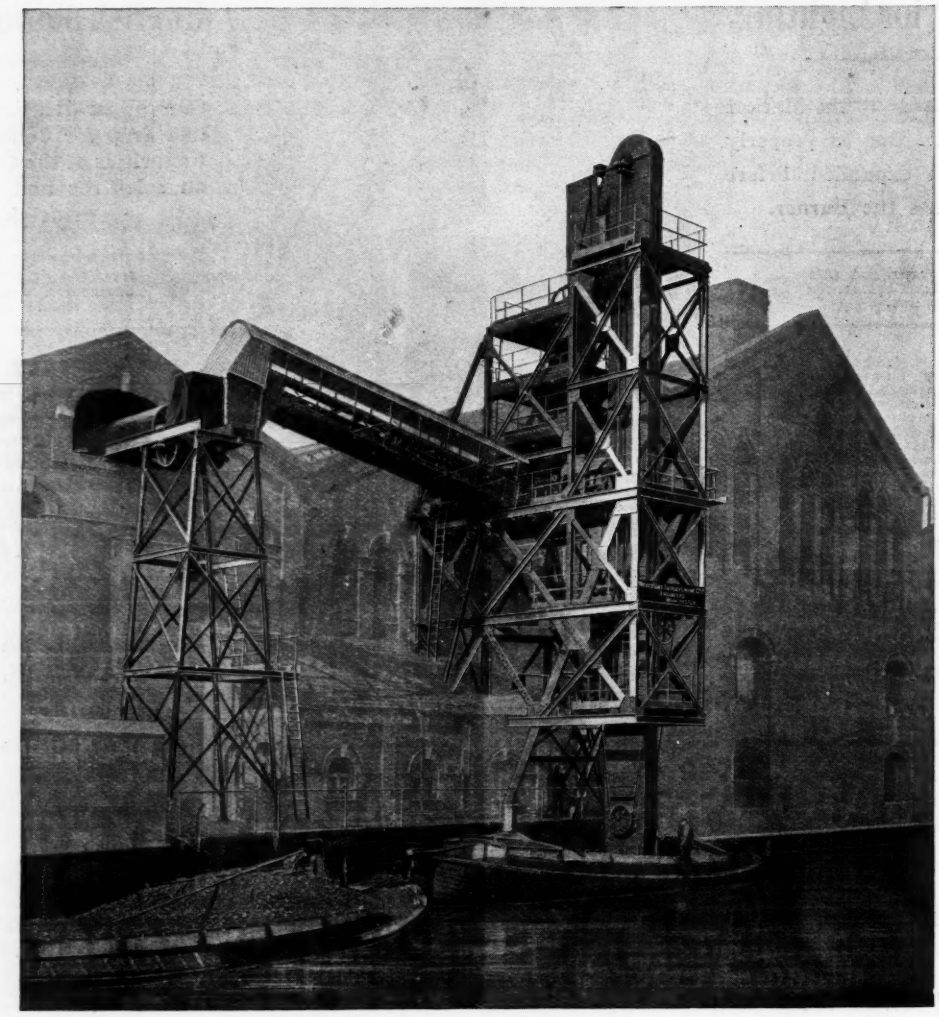
GAS AND GENERAL ENGINEERS.



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(PATENTED)

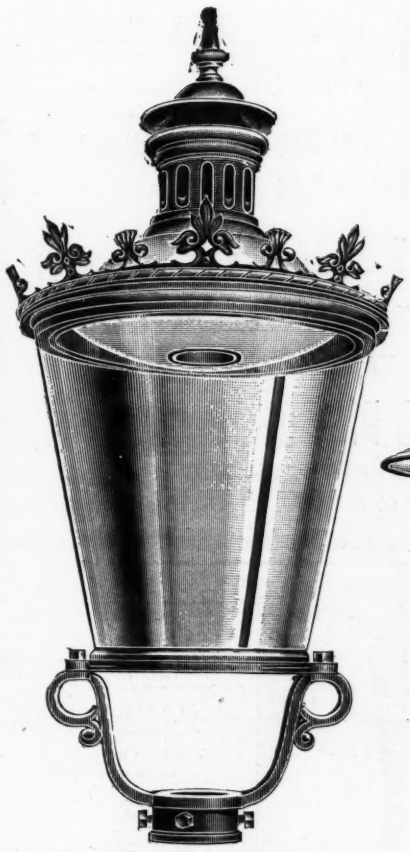

Fig. 35. 100 c.p.

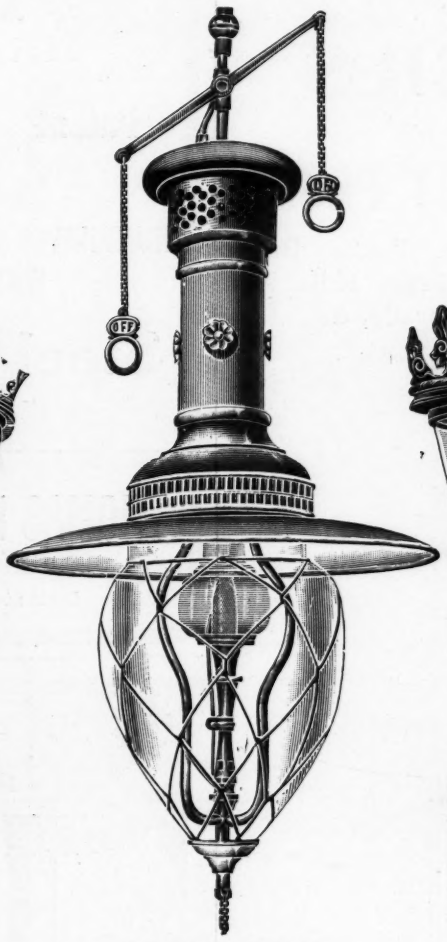

Fig. 607. 600 c.p.
Self-Intensifying.

Fig. 35a. 300 c.p.
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Thousands of the above Lamps in use and giving satisfaction.

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HIGH-POWER LAMP

(ORDINARY PRESSURE).

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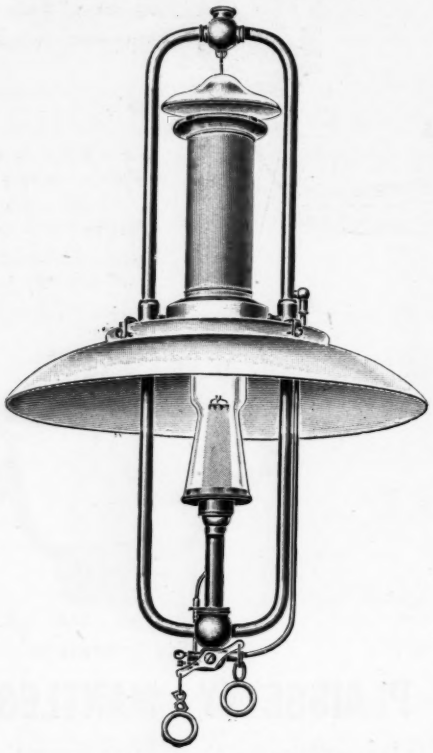

Length over all, 27 inches

Size 6a Fig. 6. Gas, 6 cub. ft. Size 8a, Fig. 6. Gas, 8 cub. ft.
Size 12a, Fig. 6. Gas, 12 cub. ft.

A. E. P. & Co., after extensive trials of their Patent Interior Lamps in various parts of the country, are prepared to **guarantee and renew** any **wearing part** of this Lamp—Fair wear and tear allowed—within Twelve Months of the date of purchase,

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The most decorative Gas-Light ever offered.

A perfect combustion Burner.

Cannot get out of order.

60-Candle Power with 2½ cubic feet of Gas.

Can be used anywhere instead of a "C" Burner.

Address of your nearest Wholesale Factor will be sent on application to No. 4374, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

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Gas Bags for repairing Mains Round Shape. All Seams Stitched and Taped.

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Oilskin Clothing, Diving and Wading Dresses, Sewer Boots, Tar Hose, Stokers' Mitts, Bellows, &c.

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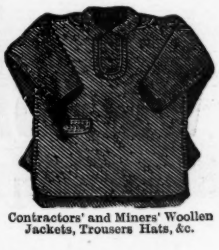

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Works: **New Southgate.**

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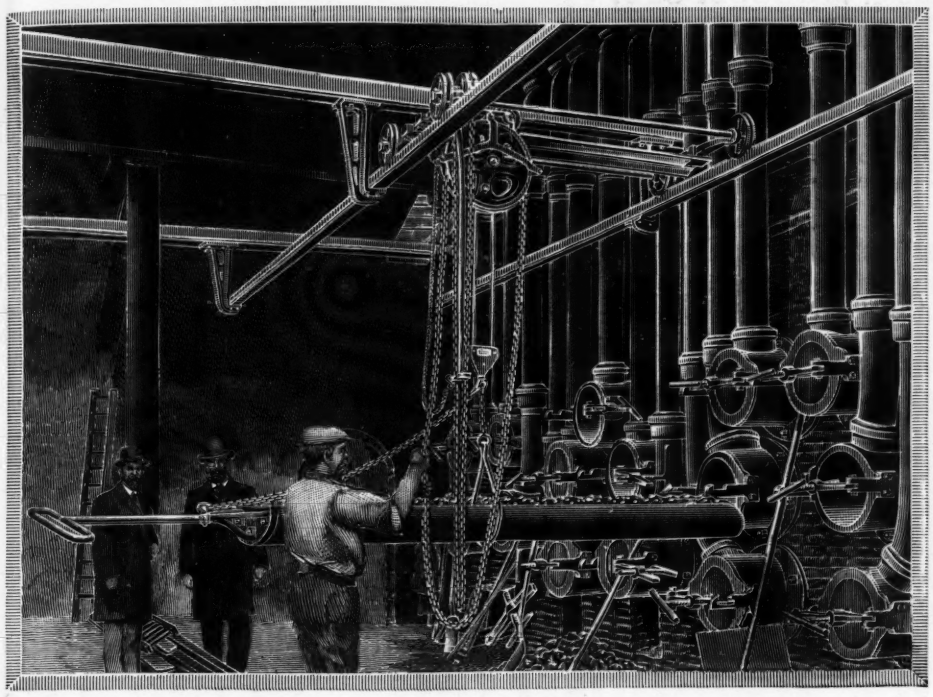

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"RAPID" MANUAL CHARGING MACHINE.

Annual Yield per Retort increased many thousands of feet.

EVEN CHARGES.

Repeat Orders—

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Machines can be seen working at any of the following Gas-Works:—

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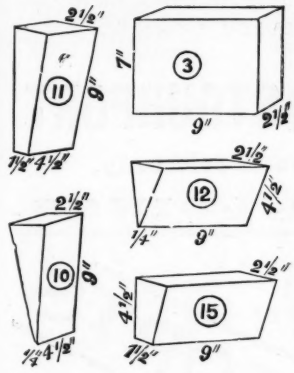
Contractors to a large number of the Principal Gas-Works.



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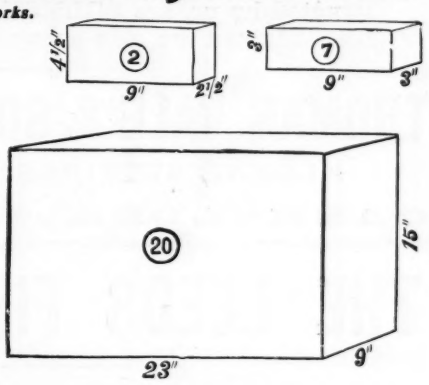
Without doubt the finest Materials in the Market for Gas-Works Furnaces.

BRICKS, BLOCKS, TILES, & SHIELDS of any shape made to order.



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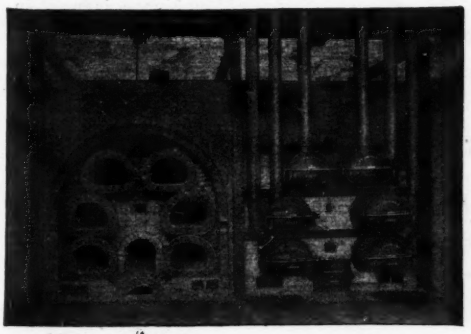

PHOTO. OF REGENERATOR SETTINGS DURING CONSTRUCTION.

REGENERATOR & GENERATOR SETTINGS

DEEP, SEMI-DEEP, AND SHALLOW.

Maximum Make per Ton and Mouthpiece.

Minimum Fuel Consumption.

NUMEROUS REPEAT ORDERS

Have been received for each of the above types of Settings.

RESULTS GUARANTEED. RETORTS RESET.

SOLE MAKERS OF **CRIPPS' PATENT CHIMNEY.**

Designs and Estimates on application.

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PATENT
"FLUXITE"
FIRE
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For
STOPPING CRACKS
IN GAS RETORTS.
Makers: JOHN E. WILLIAMS & CO., Lower Moss Lane, MANCHESTER, S.W.

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MANUFACTURERS OF
BEST FIRE-BRICKS; INCLINED, HORIZONTAL, and SECTIONAL RETORTS; LUMPS, TILES, &c., of every description.
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LIME & OXIDE ELEVATORS & CONVEYORS.
COAL AND COKE STORAGE PLANTS.
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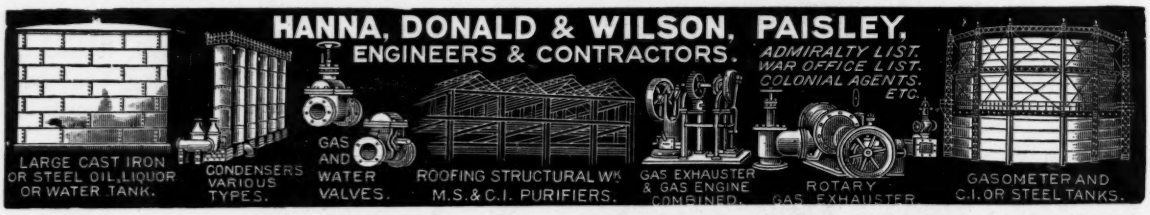
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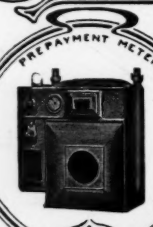

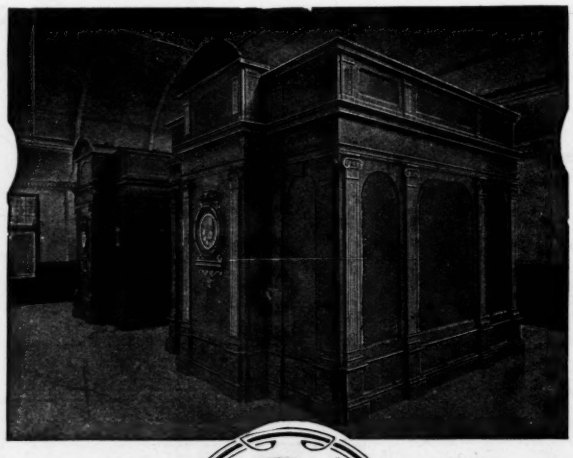

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